ELECTRICAL REVIEW

Vol. CXLVIII No. 3828 6TH APRIL, 1951

THE OLDEST ELECTRICAL PAPER • ESTABLISHED 1872

# British Railways

## THE CASE FOR ELECTRIFICATION

OPENING the I.E.E. Convention on Electric Railway Traction a year ago, Lord Hurcomb (chairman, British Transport Commission) pointed out that there was still no main-line electrification in this country in the full sense. On the same occasion, Mr. C. M. Cock showed that, on a basis of traffic density alone, 50 per cent of the lines could be economically converted to electric working. Yet, even including the extensive systems of the former Southern Railway and the London Transport Executive, the proportion is hardly more than 5 per cent of the mileage.

### Reasons for Delay

The slow growth of railway electrification here compared with some other countries is attributed to "various causes" by the committee (under the chairmanship of Mr. Cock) which has issued the latest report on the subject, particulars of which were given in our issue of 30th March. Foremost among these causes, we suggest, is an understandable pride in the performance of that outstanding British invention, the steam locomotive.

That outlook is more appropriate, however, to an era in which an annual consumption of 13½ million tons of coal with a calorific value approaching 14,000 B.Th.U./lb apparently caused little concern, although the Weir Report of twenty years ago showed that, at a cost which promised a reasonable return, the fuel consumption could be reduced to 3½ million tons of about 11,000 B.Th.U./lb if burnt in electric power stations. This economic comparison took no credit for the substantially greater revenues that have followed electrification as a result of improved services in all parts of the world as well as on the B.R. Southern Region.

### Available Experience

Responsibility for tardy development cannot be saddled on electrical manufacturers, who for thirty years or more have been laying out schemes and providing equipment for hundreds of miles of completely electrified railways overseas. Nor can it be said that electrical engineers have not made up their minds regarding the methods most suitable for Great Britain. While the present report takes into full account recent and probably future technical advances at home and abroad, it confirms the main conclusions of the Pringle Committee in 1927, which itself supported the findings of Sir Alexander Kennedy's Committee of seven years before, that 1,500 V d.c. with overhead

equipment should be the standard for future schemes. This standard did not, of course, apply to the already highly developed and originally suburban third-rail system of the Southern Railway.

The case for railway electrification can now be regarded as amply demonstrated on economic and social grounds. The chief question is one of financing the change-over in competition with many claimants for labour and materials. The priority should be high for, to quote Sir Eustace Missenden (former chairman, Railway Executive), the economic, operating and other advantages, coupled with the prevailing high traffic density, " warrant—or rather render essential " the early and progressive electrification of main-line passenger and freight traffic as well as inter-urban and suburban services. The interest taken in the subject by Lord Hurcomb when he was chairman of the former Electricity Commissioners, as well as in his present position, provides assurance that the latest report will not be pigeon-holed.

## RURAL ELECTRICITY COSTS

In the past we have contended that if rural electrification is uneconomic—from the standpoints of the Electricity Boards and the rural community—some form of assistance should be available. Support for this view comes from the South Western Electricity Consultative Council which has passed two resolutions on the subject. The first was a direct appeal for a " subvention at national level "—or a State grant. The other called for a meeting of representatives of the Council, the Electricity Board and the British Electricity Authority to consider a subvention to the Area. This rather suggests a grant from the B.E.A. which would mean that the electricity supply industry, or its consumers, would have to bear the cost. We still think that any assistance of this kind which is given to Electricity Boards should come from national funds.

## MATERIALS IN AMERICA

It is reported that American manufacturers of heavy electrical equipment are expected to receive their full material requirements for May and June under a system of " Defense Orders " instituted by the National Production Authority. The *Electrical World* states that this announcement came just as the material situation was becoming critical, for so far this year manufacturers have received only between 40 and 60 per cent of their needs. As a result, from 12 to 15 per cent of this year's production of generating plant has been lost and deliveries will be from two to five months behind schedule by 1st July. The Power Equipment Division of the N.P.A. has prohibited the export of heavy power equipment without approval. It is expected that manufacturers will be allowed to ship all unfilled orders.

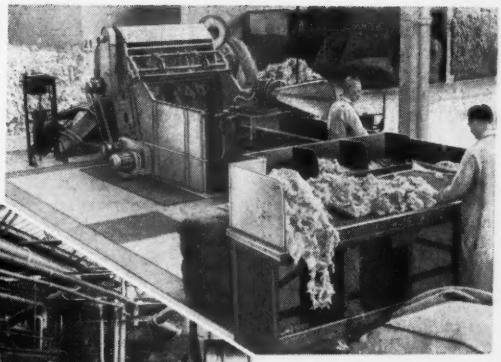
## DEPLORABLE TACTICS

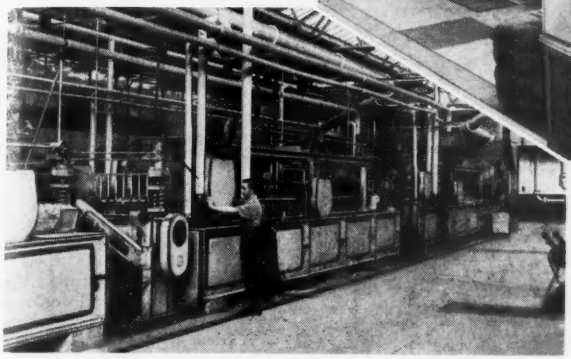
Some weeks ago a number of electricians employed by the London Electricity Board ceased work because one of their number had been discharged. He had refused to work with a member of the Transport & General Workers' Union employed by the Board on installation work. Although the strike has been recognized by the Electrical Trades Union not all of its members are sympathetic. According to the *Daily Worker*, nearly 400 building workers downed tools a week or two ago as a protest against the refusal of nine electricians upon a Government building site in Whitehall to join the strike. A " Disputes Commission " recommended the London Board to withdraw these men but quite properly the Board refused to do so. " Behold how great a matter a little fire kindleth " and behold how the public interest is injured by an inter-union squabble. Surely there are adult methods of settling disputes of this kind.

## ISOLATED TRANSMISSION

To maintain voltage constant at the consumers' end of a transmission line, varying it at the generating station to compensate for voltage drop, seems logical; but the method has marked limitations. Mr. R. L. Chantrill, in his paper presented to the Supply Section of the Institution of Electrical Engineers, reported in this issue, was able to show from his own experience that it has advantages for long-distance transmission of relatively small amounts of power on isolated radial systems, probably using salient-pole generators. It should certainly be taken into account as a possible alternative when considering schemes for providing an electricity supply in undeveloped parts of the world.

# Large Wool Mills—I





## *Applications of Individual Electric Drives*

ON seeing the new factory which Patons & Baldwins, Ltd., have just completed at Darlington one would not imagine that there is a world shortage of wool. Standing on a 140 acre site and comprising 35 acres of buildings, these new mills are the largest in Europe engaged solely on the production of knitting wools, being designed for an output of approximately 250,000 lb of yarn a week. The factory has taken about four years to build and the various sections have been put into commission as they have been completed. Certain sections are still in process of equipment.

In order to get the mills into production at the earliest possible moment a certain amount of machinery from other of the company's works has been utilized but in general it is the policy to install only the latest types of equipment, some of which involve principles quite new to spinning technique.

Most of the machines are multi-spindle units, which have been or shortly will be installed and all of them, even the older types, are individually electrically driven. It is anticipated that, when the mills are in full production, the connected power load will be about 20,000 h.p. plus 1,000 kW of lighting, the maximum demand being about 12,000 kVA. About 30 per cent of these electricity requirements, dependent on the amount of steam required for process work, can be generated by back-pressure turbines.

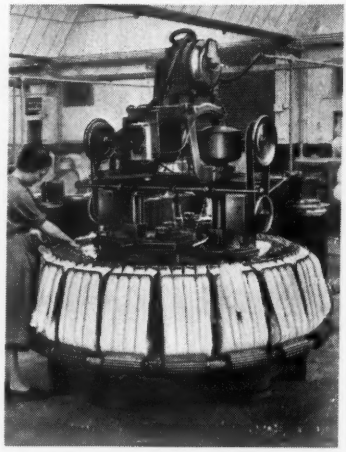
Before describing the electrical and other factory services in detail, we propose first to trace the various applications of electricity to production processes. Raw wool arrives at the works by road or rail—the original Stockton–Darlington line runs past the site—and is unloaded into store. From here it is piled before being taken in carts on a Pantin floor conveyor to be sorted by hand on to one or other of four long conveyor belts installed, together with the automatic blending system, by Spencer & Halstead, Ltd. Each of these conveyors, as well as four similar units used for dust removal purposes, is driven by a 15 h.p. motor.

Arriving at the end of these conveyors the wool is blown by pneumatic conveyors (operated by fans driven by 17½ h.p. induction motors) to the blending bins

**The title pictures show (*right*) raw wool being sorted and mixed on band conveyors and (*left*) being washed by passing through a series of tanks**

where the wool is admitted through a cyclone at the top and allowed to settle gently on the floor. From here it is loaded by hand into an orifice and sucked away to the raw wool washers (Hughes and Lancaster) where it is passed through a series of wool scouring bowls containing detergents, etc. A system of knives, rollers and slat conveyors keeps the wool "open" and carries it through the various tanks to a steam heated continuous dryer. Leaving the dryer, the wool is given an oil spray to give an added flexibility in later processes and then blown to the storage hoppers.

At this point the process of straightening the wool fibres commences, the first stage being carding. The Platt machines (9½ h.p. motors) employed in this process incorporate a series of rollers of various sizes and rotating at different speeds. These rollers are covered with wire cloth to draw out the fibres, the wool leaving the machine in the form of a sliver or continuous circular strip, which is fed into large cylindrical cylinders or cardcans.



**Rotary combing machines brush the slivers as they pass through metal spikes**

The wool is washed and conditioned and then passed through gill boxes, incorporating corrugated rollers and vertically operating combs. These machines are driven through reduction gearing from 9½ h.p. motors. Prince, Smith and Stells Nobel combing machines (5 h.p. motors) embodying high-speed dabbing brushes, revolving circles of pins, continue the process, each machine handling simultaneously eighteen sets of four strips of wool. Further treatment in gill boxes (2½ h.p. motors) completes the work in this department.

Dyeing is carried out either at this stage in a dyehouse close by (the "top dyehouse") or when the wool has reached the hank stage. Electrically operated equipment of the top dyehouse includes hoists and circular vats fitted with propellers.

From the combing department onwards considerable use is made of a Pantin conveyor system comprising an endless chain inset into the floor to which trolleys can be attached at will. The combed wool is taken in these trolleys up an incline, over a road running through the factory buildings, to the mixing and top department.

To obtain the qualities and colours required, various wools are blended in mixing boxes, machines with a pair of steel rollers running at different speeds to give a combing effect. The process is repeated in machines similar in most respects except that the wool leaves them in the form of balls instead of loose in gill boxes. All these machines have 1½ h.p. motors.

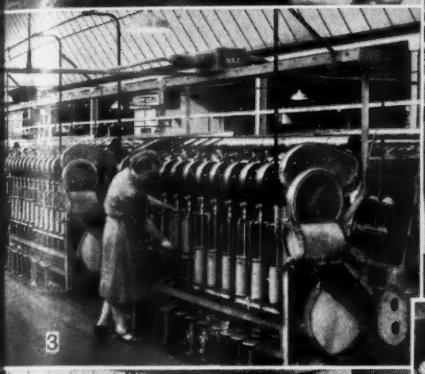
Thus blended, the wools pass on to the drawing department where the gauge is gradually reduced in five operations. In the first machines used, can gills (1½ h.p. motors), similar to equipment already referred to, a number of coils of wool are put through together and emerge without any twisting. The 2-spindle gills, which also have 1½ h.p. motors, continue the reduction by the use of rollers running at different speeds. They also impart a twist and for the first time the wool goes on to bobbins.

Further reduction is achieved on 6-spindle weigh boxes (or first drawers) by the use of

**See opposite page: (1) Back wash machine where the reduction of the thickness of the slivers commences. (2) Further combing is carried out in gill boxes. (3) Finishing, the last operation in the drawing department. (4) A row of mixing machines. (5) A Pantin conveyor system carries trucks around the factory. (6) Dryer through which the hanks are passed after scouring. (7) Hanks of wool being lowered into a dyeing vat. (8) After dyeing the hanks go through successive baths of the scouring machine**

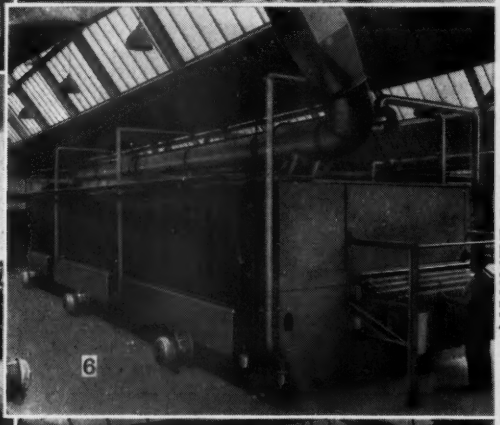
1

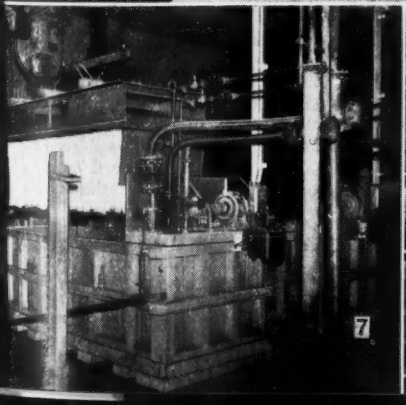
2


3

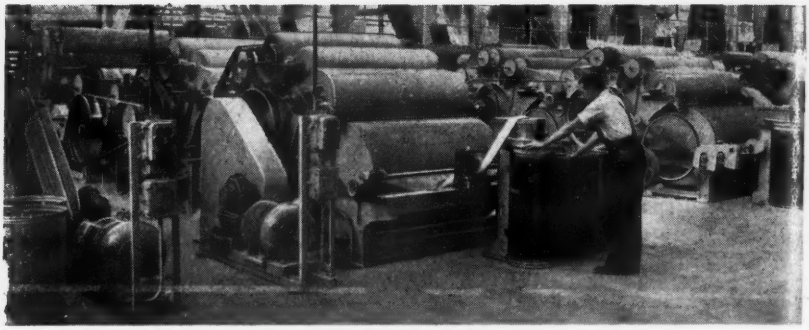
4

5


6


7

8



**On the carding machines the wool is combed out by canvas rollers covered with wire bristles and formed into " slivers " or continuous strips**

different speeds of rollers, the wool on leaving these machines being weighed. Smaller diameter rollers are used for the 10-spindle or second draw machines, the finishing operation being carried out on 12-spindle units. The motors used for the first and second draws are of 3 h.p. and 4 h.p. respectively, while those for finishing are of 2½ h.p.

In the next process, roving and re-roving, the wool is further reduced and twisted by passing it through apertures. A single 3 h.p. motor drives a group of 30–40 spindles at speeds of about 1,100 r.p.m. in the case of rovers and 3,000 r.p.m. in the case of re-rovers.

Until recently the only machines available for the complete process of yarn making, the final reduction and twisting, were cap and ring spinners and " flyers," all of which achieve the desired effect by the use of rollers running at different speeds, adjustment of the distance between the rollers giving the required thickness. In the cap spinning the yarn received from the re-rovers bellows out round the bobbins; in ring spinning it travels up and down the bobbins. Flyers, to which the wool comes direct from the rovers without the re-roving process, produce a coarser yarn. None of the cap and ring machines has a spindle speed greater than about 6,000 r.p.m., while flyers run at little more than half this speed.

Speeds of up to 15,000 r.p.m. are, however, possible with the use of the new P.S.C. centrifugal machines which are now rapidly superseding other types of equipment. As their name implies, these machines operate on the centrifugal principle, the yarn being spun on to the insides of the cylinders and the bobbins being slipped in at the last minute. Various electrical safeguards are incorporated, including, in the latest types, solenoid operated devices (operated by a 24 V supply) to cut off the yarn feed in the event of ends breaking, thus preventing the winding up of the yarn round the rollers. Like the other types of yarn finishing machines, these new units are arranged in groups of 150–200 spindles (75–100 a side back to back), driven by motors of 8 h.p.

After twisting into the requisite number of plies the wool is reeled into hanks or transferred on to cones for hosiery manufacture.

Wool to be dyed in hank form is taken in bundles to the dyehouse. Here it is lifted by means of 35 cwt hoists to the vats, of which there will eventually be between thirty and forty and of which the largest each has a capacity of 200 lb of dry wool. The dyeing liquor is brought up to 125 deg F before the wool is admitted and then raised to boiling point, being kept in motion by means of an electrically driven propeller. The dyeing time is 2½–3 hours.

Steam coils are used to heat the dyeing vats and also the five tanks used for the next process, scouring, in which the wool is passed through a succession of soapy, detergent and plain water rinses, thermostatically controlled by " Satchwell " units. For passing through the baths the hanks are woven through a set of narrow conveyor

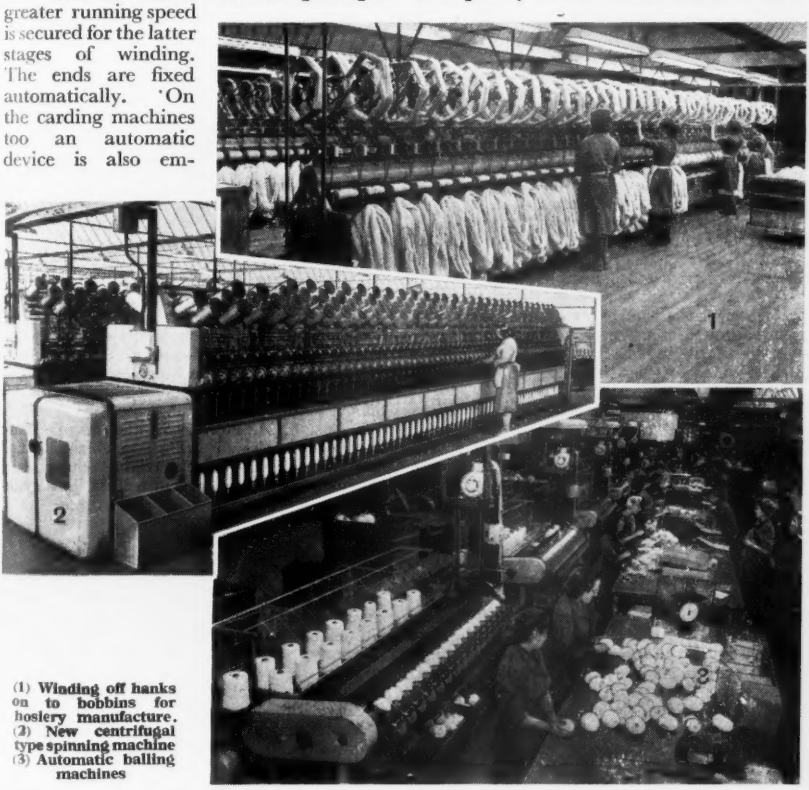
bands driven through vee belts, shafting and reduction gears by means of 18½ h.p. and 12½ h.p. motors. The liquids are removed by means of rollers and squeezers.

After being transferred to non-rusting metal supports, the hanks are loaded on the endless belt of one of the two steam heated dryers (Petrie and McNaught) where they spend 35–70 minutes at a temperature of 125 deg F. The conveyor is driven by a 3 h.p. variable speed motor and the hot air is circulated around the dryer by means of six 7½ h.p. fans in the case of the smaller machine and ten in the case of the large.

In the ticketing and make-up department the yarn is sorted, weighed, inspected and, if necessary, re-wound on a different type of bobbin, carded or balled. A feature of the balling machines (2 h.p. motors) is that with the aid of eccentric gearing a greater running speed is secured for the latter stages of winding. The ends are fixed automatically. 'On the carding machines too an automatic device is also employed for cutting off the wool when the correct weight has been wound.

All labels and stationery are prepared in the company's own printing department. There is also a section equipped with looms (2½ h.p. motors) for making canvas mats for use in rug making. Electrical aids in the warehouse where the packing and despatch are carried out comprise band conveyors (1 h.p. motors) and a hydraulic baler (5 h.p. motor).

In designing the lighting scheme, the requirements peculiar to each department have been taken into consideration. To provide what might be called a basic illumination spherical fittings housing tungsten lamps have been suspended from the roof. In the ticketing and make-up department mercury vapour discharge lamps were originally substituted but subsequently it was found that a mixture




(1) Winding off hanks on to bobbins for hosiery manufacture. (2) New centrifugal type spinning machine (3) Automatic balling machines

of half tungsten and half m.v. lamps provided better conditions for colour discrimination. M.v. lamps alone are, however, found more suitable for colour matching in the oil stockroom where the wool is kept between dyeing and scouring.

Fluorescent lighting utilizing 5ft 80 W fittings has been adopted for the ticketing and make-up department but this has been found to be too bright for the spinning operations and so tungsten lamps have been generally chosen for local lighting for early stages of production.

Attractive ceiling fittings and wall brackets have been installed in the works canteen which, seating 2,000, is also equipped with a 4-colour stage lighting installation (W. J. Furse) complete with cyclorama, footlights, battens, spotlights and dimmer; a public address system (G.E.C.); emergency lighting apparatus ("Ediswan"); and its own air conditioning system. Serving this canteen and also the staff canteen accommodating 400 is a kitchen, which though employing steam and gas for cooking, has available two Peerless mixers, a potato peeler and a chipper, a Benham "Hercules" dish washer, three Hall refrigerators and an automatic ticket issuing machine (Auto-Ticket Co.).

Throughout the building virtually all the motors and switchgear, with the exception of the small motor starters, which are of Allen West construction, have been supplied by the English Electric Co., Ltd. The Britmac Electrical Co., Ltd., produced all the switches for lighting and local power points.

Sir Alexander Gibb & Partners were the consulting engineers, the electrical installation being carried out by W. J. Furse & Co., Ltd.

In a further article we propose to describe the arrangements for the electricity, heating, ventilating, water and process steam services.

## Automatically Wound Tower Clocks

THE way in which power cuts and variations of frequency are affecting the type of mechanism selected for electric tower clocks is very well exemplified by the recent work of Chas. H. Potts, Leeds, who make both automatically-wound and synchronous models.

They report that the great majority of new public clocks are likely to have their own pendulum and escapement, or be controlled by a master-clock; in both forms the winding of the weight which supplies the energy is done by an electric motor.

Automatically wound clocks from the Leeds works include one with three 4ft dials in a projecting bronze bracket for Eustace & Co., goldsmiths, of Warrington; a timepiece with three 6ft dials for Joseph L. Thompson, Ltd., shipbuilders, of Sunderland; and an hour-striking clock with one 4ft dial for Duxford Church, Cambs. An order for two clocks came from Smith's Dock Co., Ltd., of North Shields, one being an auto-wound timepiece with gravity escapement and four 7ft illuminated dials while the other will have two 4ft illuminated dials for the fitting shop. Montague Burton, Ltd., have purchased an auto-wound timepiece with pin-wheel escapement to drive one 5ft dial on their premises at Burnley and a similar clock has gone to Wadsley Bridge, Sheffield.

Even overseas buyers seem to prefer automatic winding. The new clock for Milton Buildings, Salisbury, Rhodesia, with three 9ft dials is of this type as also is the timekeeper for the Indian Girls' School, Nairobi, with a pin-wheel escapement and one 4ft dial.

Though numerically inferior, synchronous clocks are not quite out of favour, for the list includes two examples with 4ft dials made to the order of West Riding County Council and installed at Montaney Crescent and Mausell Crescent Infants' Schools; a projecting bracket clock for the shop of Messrs. H. Samuel, Piccadilly, Manchester; and a timepiece for Wheatley Hill, Durham, school building, with two 3ft dials fitted into a projecting case.

Messrs. C. H. Potts have also installed two electrically powered tolling machines, which somewhat resemble clock striking mechanisms, to sound on two very ancient bells in the Minster at York.

## Batti-Wallahs' Society

IN view of the prominence which has been given of late to suggestions that clemency should be extended to the men sentenced at Nuremberg and by other military tribunals in Germany, there was added interest in the address which Sir Hartley Shawcross gave at last week's luncheon of the Batti-Wallahs' Society. Sir Hartley chose as his subject "War Criminals," and his address was a justification of the sentences passed by the military tribunals.

# Variable-Voltage Generation

## *Radial Transmission in Sparsely Loaded Areas*

IN a paper presented before the Institution of Electrical Engineers (Supply Section) on 21st March, Mr. R. L. Chantrill (British Thomson-Houston Co., Ltd.) submitted that transmission methods that had been evolved to meet the needs of the more industrially advanced countries were not necessarily the best for undeveloped parts of the world.

Where relatively small loads had to be transmitted radially for 200 to 300 miles from single power stations, perhaps supplying minor loads on the route, the author claimed that variable voltage generation applied to a.c. power systems would generally be less costly and would improve overall system efficiency and reduce considerably the capacity of synchronous condensers; it would also give a closer control of reactive power and provide a definite basis of regulation of system voltage with fewer regulating points.

On the other hand salient-pole alternators, costing slightly more than wound rotor machines, and special means for maintaining reasonably constant voltage for the station auxiliaries would be required.

### DISCUSSION

The discussion was opened by Mr. E. L. E. Wheatcroft (Merz & McLellan) who agreed that undeveloped areas required different treatment from developed areas, though the people in the former tended to think that they should copy American and British practice and were surprised when told that their problem was different. There were many places, as was shown in a report which his firm had just prepared for the Government of Pakistan, where the right thing was to have small local diesel-engine generation for a long time to come.

The distinction which should be made in considering the applicability of the author's proposal was not, however, between developed and undeveloped areas, as such, but between generation at the load centre and generation a long distance away. As a rule magnetizing kVA could be provided more cheaply in the generator than by synchronous condensers and the applicability of the author's proposal depended on at how many points in the transmission line, or at what points, it was desired to keep the voltage constant or the regulation down to a tolerable amount. For lightly-loaded lines from a distant hydro-electric station to a load centre it might be quite useful, but it was doubtful whether the author was right in claiming for it improved overall system efficiency, a reduction of generating plant and increased stability.

### Single and Double Circuit Lines

Mr. M. A. Bird (Metropolitan-Vickers) said that all systems of the type described suffered from low load density and remoteness from the power source. The system proposed by the author was one of the least harmful ways of tackling the problem and he was glad that the author advocated double-circuit lines. Otherwise when the load increased and the stability limit of the system must be increased the only economic way of doing it on a single-circuit system was to apply auto-reclosing to the existing circuit-breakers, which would make the ratio of the cost of protective switchgear to that of the transmission line too high.

Mr. G. E. Faulkner-Nuttall (Preece, Cardew & Rider) expressed some doubt about the economic results shown in the paper. When about 25 years ago the original 220 kV lines were built in America the question of raising the voltage at the sending end was considered, but one of the difficulties was corona loss and that had been intensified now that they must not ignore interference with radio. On one big system on the Continent, for that reason, the voltage rise at the sending end had been limited to 5 per cent.

Dr. J. H. Walker (B.T.H.) said that in many cases the saving in cost by embodying most of the leading kVA in the machine design would be only about 20 per cent, as compared with the author's 45–50 per cent. Furthermore, in one scheme with which he had been concerned recently, involving a hydro station of 500,000 kVA transmitting over several hundred miles, comparison

between embodying a good deal of the leading kVA in the alternators and generators and almost the whole of it in condensers, showed that on the basis of machine costs only the former alternative involved an additional 16–20 per cent.

Mr. M. W. Humphrey Davies (Imperial College) drew attention to the system used by Electricité de France to control its transmission network. It had been found by experience, he said, that on the 220 kV system from hydro plants in the central plateau to Paris the maximum safe working voltage was 245 kV, so that at full load they pushed the sending end voltage up to 236 kV and brought it down to about 228 kV, the corresponding variations in Paris being 215 kV at full load rising to 220 kV at no load. The variation at intermediate stations was kept within ± 2 per cent.

## Use of D.C.

Mr. R. K. Edgley (A. Reyrolle & Co.) suggested that there was an argument for a lower nominal voltage to reduce the charging MVA, even if it involved a greater copper area. The protection of the circuit involved considerable complications and expense, so further investigation might be desirable into the use of d.c. for the type of service in question before going ahead with complicated a.c. systems which might not be so satisfactory.

Dr. J. R. Mortlock (B.T.H.) said that with generation at the two ends of the system, the machine with the faster governor would take up any load swings. If the regulator were compounded for in-phase (in other words, for watts) it would automatically vary its voltage, while the generator at the other end would be relatively unaffected.

Mr. C. G. Carrothers (Kennedy & Donkin) made a number of criticisms of the Evans and Sells charts given in the paper and suggestions for their improvement.

Mr. C. P. Holder (Metropolitan-Vickers) differed from the author in his comparison of synchronous condensers on the basis of their leading kVA output. The cost could be more accurately estimated, he suggested, in terms of the sum of the leading and lagging outputs. On the whole, however, the author's conclusions were probably not far off the mark.

Mr. G. R. Slemon (Imperial College) referred to the way in which the author's proposals had been applied in the system of the Hydro-Electric Power Commission of Ontario. One example was a 25 c s 220 kV line 295 miles in length, without local load at the generation end or intermediate loads, which during the war had to transmit more power than it had been designed for. It had been found possible to supply 150 MW at 0·9 power factor with only 35 MVA of synchronous capacity by increasing the voltage at the transmitting end during maximum load periods to 241 kV. At the receiving end, a more or less constant voltage point, it was reduced to 192 kV, a regulation of 25·5 per cent. The line losses were 14·2 per cent, which might seem excessive and might suggest that high regulation meant high losses. That was not necessarily the case. In a hydro-electric system it was often important that the line should be operated at maximum efficiency during maximum load periods to make the best use of installed turbine capacity. To obtain that maximum with long lines and a given receiving end voltage, it was necessary to operate at quite high values of regulation.

## Over-voltage Risk

Mr. K. M. Jones (B.T.H.) said that the author had shown how to get maximum efficiency out of a simple system such as was generally in use in India, but raising the sending end voltage at times of maximum load could aggravate the dangerous over-voltages which could follow a complete and sudden loss of load at the receiving end. The risks were admittedly remote, but the condition should be allowed for when viewing the whole economy of a system.

Mr. G. Lyon (A.E.I.) said that if there was to be a margin for accidental over-voltages which would be the same for operation at 110 or 100 per cent at the sending end, the efficiency might be better if the system were operated at a flat 110 per cent voltage. That point became important as the loading of the system increased. The Swedish 220 kV system had normally been operated at 230 kV at the sending end tapering to 210 kV over a transmission distance of 250 miles. Recent investigations appeared to indicate that the total annual cost would be lower if synchronous condensers were installed sufficient to enable the voltage to be maintained at the higher level throughout.

The author briefly replied.

# Electric Cooking in the Nineties

## *An Early Electrical Development Banquet*

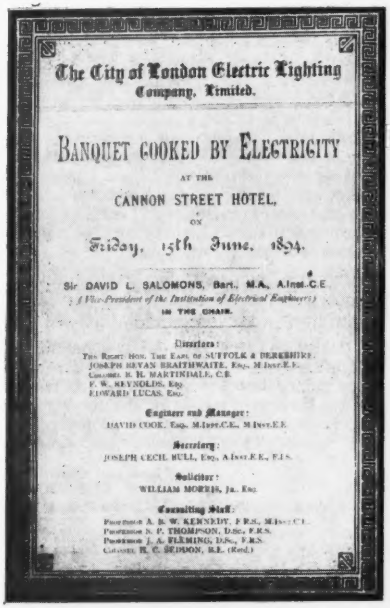
NEXT Friday the Electrical Development Association holds its annual meeting—the 31st—but electrical development began more than thirty-one years ago. Mr. H. J. Randall, chairman of the London Electricity Board, has sent us a souvenir which not only reminds us of the antiquity of electric cooking but also of the remarkable digestive powers of an earlier generation.

It is a menu printed for a "Banquet Cooked by Electricity" arranged by the City of London Electric Lighting Co., Ltd., at the Cannon Street Hotel on Friday, 15th June, 1894. This was discovered by Mr. H. H. Spencer, of Crompton Parkinson, Ltd., among some old papers in the Crompton Historic Collection at Chelmsford. We have reproduced it in the hope that readers will be able to see how our forebears went about it when they feasted. The list of directors and officials contains some names well-known in the electrical industry; it includes Sir David Salomons, Bt. (who presided at the banquet), Mr. J. B. Braithwaite, Professor Silvanus Thompson, Professor J. A. (later Sir Ambrose) Fleming and Professor A. B. W. (afterwards Sir Alexander) Kennedy.

The Lord Mayor of London was a guest and an *Electrical Review* representative was also among those present and his report (22nd June, 1894) was quite lyrical in parts. Apparently even for those days the meal was a good one for it is recorded that it "drew encomiums from the chief magnate of the city famous for sumptuous repasts."

Introducing the real object of the banquet our report says:—

> "Electricity as an illuminant has slowly but none the less surely been coming to the front of late in competition with other forms of lighting, but it is only recently that the possible application of the current to cooking operations has attracted serious attention in this country, but it has now come to stay. Certain it is that the utilization of electricity in this direction was a revelation to many gentlemen who were privileged to take part in last Friday's gathering, and expressions of surprise and approval at the excellence of the cooking were heard on all sides.
>
> "In the kitchen, which was a carpeted room adjoining the reception room, were placed some five or six electric ovens raised above the floor on tables, and on an adjoining table were electric hot plates, electric saucepans, electric fish kettles, and other culinary necessities, all working by electricity.
>
> "There was no combustion, the heat being generated in resistances placed in enamel on the sides, top and bottom of the oven. Each side, together with the top and bottom, is separately regulated by a switch placed at one side of the oven. Thus it will be seen that no smoke or smell is given off, a state of things inseparable from oil, gas, or any other form of cooking appliance.
>
> "The apparatus used at Cannon Street was



The City of London Electric Lighting Company, Limited.

BANQUET COOKED BY ELECTRICITY

AT THE

CANNON STREET HOTEL,

ON

Friday, 15th June, 1894.

Sir DAVID L. SALOMONS, Bart., M.A., A.Inst.C.E.

(Vice-President of the Institution of Electrical Engineers)

IN THE CHAIR.

Directors:

THE RIGHT HON. THE EARL OF SUFFOLK & BERKSHIRE.
JOSEPH BEVAN BRAITHWAITE, Esq., M.Inst.E.E.
COLONEL R. H. MARTINDALE, C.B.
F. W. REYNOLDS, Esq.
EDWARD LUCAS, Esq.

Engineer and Manager:

DAVID COOK, Esq., M.Inst.C.E., M.Inst.E.E.

Secretary:

JOSEPH CECIL HULL, Esq., A.Inst.E.E., F.I.S.

Solicitor:

WILLIAM MORRIS, Jr., Esq.

Consulting Staff:

PROFESSOR A. B. W. KENNEDY, F.R.S., M.Inst.C.E.
PROFESSOR S. P. THOMPSON, D.Sc., F.R.S.
PROFESSOR J. A. FLEMING, D.Sc., F.R.S.
COLONEL R. C. RIDDON, R.E. (Retd.)

**Front of the menu for the City of London Co.'s banquet in June, 1894**

all supplied by Messrs. Crompton & Co., Ltd., and the General Electric Co., precisely as illustrated in the *Electrical Review* article of September 29th, 1893, and the task of fitting up the apparatus was very ably carried out by Mr. Brydon.

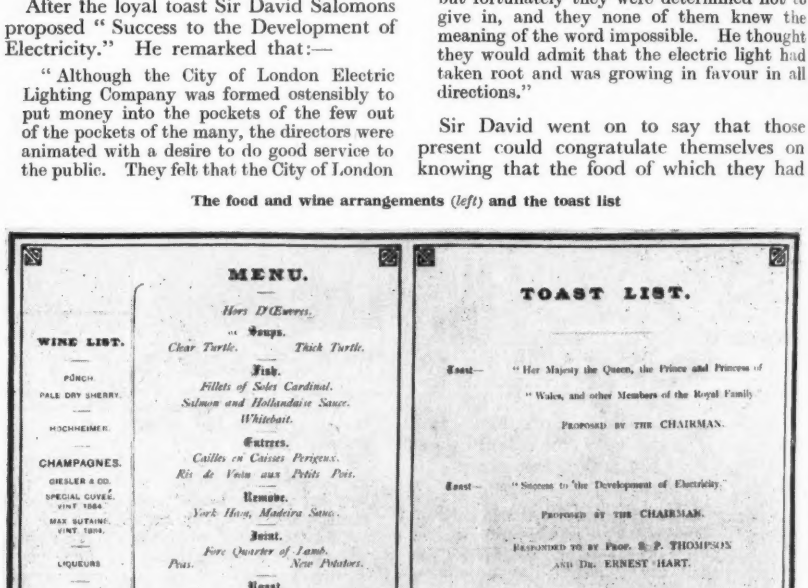
"Once having obtained the desired heat by the application of the current in all directions around the surfaces of the cooking chamber, it is 'bottled up,' so to speak, and, excepting the leakage, owing to no substance being absolutely non-heat conducting, we can keep it and turn it to whatever use we wish. There is no necessity for having a draught, as is the case with coal or gas fires, and consequently there is no waste whatever of heat, and, what is a very great desideratum, no carrying of the fumes and smell of cooking throughout the house or neighbourhood in which it is being carried on."

After the loyal toast Sir David Salomons proposed "Success to the Development of Electricity." He remarked that:—

"Although the City of London Electric Lighting Company was formed ostensibly to put money into the pockets of the few out of the pockets of the many, the directors were animated with a desire to do good service to the public. They felt that the City of London should be served better than any other part of the globe, and before they had done they hoped that they would be able to accomplish the aim in view. Neither trouble nor pains would be spared to make the service thoroughly efficient. The company had supplied 97,000 lamps to the City authorities, apart from any supplied to the public. They often heard complaints of the tearing up of the roads; still, when he told them that 600 miles of wire had been laid down in some 40 streets, it would give them some idea of what the company had done during the period they had been in existence. Then it was said the cost of electricity was three times what was paid for gas. But they must remember that the light was three times as good, and he was sure none of them wished to go back to the old times. Only those connected with the company knew the uphill work they had had, but fortunately they were determined not to give in, and they none of them knew the meaning of the word impossible. He thought they would admit that the electric light had taken root and was growing in favour in all directions."

Sir David went on to say that those present could congratulate themselves on knowing that the food of which they had

**The food and wine arrangements (*left*) and the toast list**



MENU.

*Hors D'Œuvres.*

**Soups.**

*Clear Turtle.* *Thick Turtle.*

**Fish.**

*Fillets of Soles Cardinal.*
*Salmon and Hollandaise Sauce.*
*Whitebait.*

**Entrées.**

*Cailles en Caisses Perigeux.*
*Ris de Veau aux Petits Pois.*

**Remove.**

*York Ham, Madeira Sauce.*

**Joint.**

*Fore Quarter of Lamb.*
*Peas.* *New Potatoes.*

**Roast.**

*Ducklings.* *Chips.* *Salad.*

*Asparagus Sauce Mousseline.*

**Sweets.**

*Windsor Pudding.*
*Charlotte Russe.* *Liqueur Jelly.*
*Ice Pudding.*

**Dessert.**

**Café Noir.**

WINE LIST.

PUNCH.
PALE DRY SHERRY.
HOCHHEIMER.

CHAMPAGNES.

GIESLER & CO.
SPECIAL CUVÉE. VINT. 1884.
MAX SUTAINE. VINT. 1884.

LIQUEURS

DESSERT WINES.

CHATEAU LAROSE.
THOMPSON & CROFT'S OLD PORT.

CANNON STREET HOTEL,
KITTER & PUZEY, *Proprietors.*
J. APTOMMAS, *Manager.*

TOAST LIST.

Toast— "Her Majesty the Queen, the Prince and Princess of Wales, and other Members of the Royal Family"

PROPOSED BY THE CHAIRMAN.

Toast— "Success to the Development of Electricity"

PROPOSED BY THE CHAIRMAN.

RESPONDED TO BY PROF. S. P. THOMPSON AND DR. ERNEST HART.

Toast— "The Visitors."

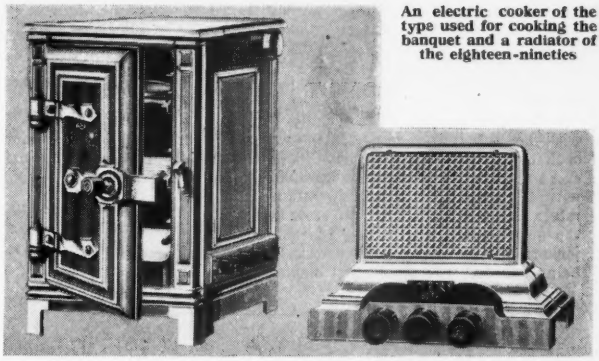
PROPOSED BY THE RIGHT HON. THE EARL OF SUFFOLK AND BERKSHIRE.

RESPONDED TO BY THE RIGHT HON. THE LORD MAYOR.

partaken was free from all gases:—

"There was no taste of gas or coal in anything that had been placed before them that evening, although he did not contend that the cooking was everything that could be desired, which was doubtless due to the chef being unused to the system, an apology which was certainly not needed. They had been asked why they charged 8d and 9d a unit, while in the West End only 6d was charged. His answer to that was the company was a young one, and that they only had five working days a week to seven in the West End. If their customers chose to live in the City they would be able to supply them as cheaply as in the West End. The directors, however, were prepared to charge only 4d a unit where the electric energy was used merely for cooking purposes, and at that price they would compare favourably with that of any of the gas companies.

"Coming to the dinner given that evening, he found that the ovens erected for the occasion were capable of providing for 120 guests, while the number of units used was 60. Thus the cost per head was 2d for 10 courses, of which the dinner consisted."



**An electric cooker of the type used for cooking the banquet and a radiator of the eighteen-nineties**

In concluding his report our representative delivered himself of the following testimonial and cautious prophecy:—

"However, the demonstration by the City of London Electric Lighting Company proved beyond the shadow of a doubt the perfect adaptability of the electric current for culinary purposes. No fires have to be kindled, and much time occupied and coal consumed before they can be termed bright cooking fires; no heat is wasted when the process is over, as in ordinary ranges, nor, indeed, during the time the viands are in course of preparation, for it is concentrated wherever required, and can be regulated to a nicety; no smells except from the succulent food itself; no dust or dirt, but everything perfectly clean; no boiling over into the fire; a much cooler and purer atmosphere for cooks and scullery maids; no every-day cleaning of blackened cooking utensils of all kinds; in fact all the vicissitudes and hardships under which chef, or good plain cook, have so long laboured, and which have tended to embitter their usually amiable tempers, are within measurable distance of being removed, and we trust that last Friday's diversion may be the means of an universal adoption of electricity for cooking, at least, in the houses of the wealthy, for it will prove an inestimable boon to cook, if not to policeman; and, perhaps, in the long run, taking everything into consideration and not merely comparing the cost of heat energy alone, cheaper than either coal or gas fires. Time only, however, will demonstrate this beyond any possible doubt."

The article of September 29th, 1893, referred to above was on "Recent Advances in Electric Heating" and was based on work carried out by Mr. Binswanger of the General Electric Co. In it were descriptions and illustrations of a cooker, kettles, a stew pan, a radiator, an iron and a coffee pot and it is made clear that they were all quite substantial jobs. We reproduce the pictures of the cooker and the radiator to illustrate this point.

The article refers to the difficulty experienced in finding an insulation for the wiring which would withstand the heat. Both asbestos or mica wrapping and enamelling were found unsatisfactory and Mr. Binswanger claimed to have overcome the trouble by the use of a cement which retained its insulating properties under the greatest heat. Strangely he came to the conclusion that:—

"The expedient of making an oven of double sides, lagged between the two sheets with asbestos for the purpose of retaining the heat, it useless. It is found that the lagging acts as a conductor. What he considers to be the best arrangement for an electric oven is to obtain some surface which can be kept bright and smooth either outside or inside, to prevent radiation; if it is necessary to have a second receptacle or cover round,

the lagging should not be of any substance but of air, which, however, must be in a state of rest."

It is stated later in the article that:—

"The electric ovens are usually provided with five circuits placed at the top and sides; each circuit takes 4 amperes. The makers claim that they can obtain a heat of 400 deg with 20 amperes in about 15 minutes, and retain the heat for a long time after switching the current off. It is expected that the air jacketing and bright surface which is now being adopted will effect great economy, and that 10 amperes will be quite sufficient for ordinary cooking."

The conclusion is reached that

"sufficient has been said to show that the application of electricity for heating and cooking purposes is practical, and it only needs the cheapening of electricity to bring electric cooking within the use of all consumers of electricity."

According to the Electrical Development Association there are now well over two million electric cookers in use and so the prophecy has been fulfilled.

# Non-Ferrous Metal Allocations

MONTHLY announcements of allocations of copper, lead and zinc, which have been made to industry by the Ministry of Supply since the beginning of this year, are to be suspended. Announcements will in future be made only when there is a significant change in the supply position, or when a major change in distribution methods or the basis of allocations is contemplated. No such change is planned for April in the case of copper and zinc.

The lead supply position has become more difficult, because of shipping problems, but no change will be made in the basic allocation of lead to consumers who may purchase a quantity not exceeding 90 per cent of their average monthly consumption in 1950, from the Directorate of Non-Ferrous Metals, Rugby. This allocation, however, will represent the limit of deliveries of imported virgin lead. Orders placed for April delivery will be taken into account and set off against the quota. Undelivered tonnage outstanding against contracts, even though it represents undelivered quotas for previous months, will be frozen until supplies of lead permit the contracts to be honoured. Until further notice, purchases of imported virgin lead beyond the current month will be restricted one month ahead.

The Ministry emphasizes that the announced allocations of virgin copper, lead and zinc are only to firms who are first line users—those who habitually buy direct from the Ministry. These firms will not necessarily distribute their products to customers at the same percentage rates, but may have to vary allocations according to the importance of the customers' products. They will also have to vary the rates of distribution according to the availability of scrap or secondary metal.

Buying arrangements are therefore as follows:—A consumer may buy from the Directorate of Non-Ferrous Metals at the beginning of each month:—Copper: Without premium, full quota for current month and the following month; subject to premium, following 5 months, full monthly quota. Lead: Without premium, full quota for current month and the following month; no further forward buying. Zinc: Without premium, full quota for current month and half the monthly quota for the following month; no further forward buying.

There is no change in the present arrangement whereby quantities already purchased are applied against the appropriate quotas.

## MINE WINDERS

IN order to compare the rope stresses when a mine winder is driven on the Ward-Leonard system or by induction motor with a rotor resistance (liquid) controller, a number of mathematical investigations have been made of behaviour during acceleration and retardation periods with a light load at high speed and a heavy load at low speed.

The object of the examination was to find out how nearly the conventional calculated speed, torque and input might be approached in practice with a view to determining the causes of departure therefrom. The results were given by Mr. T. H. Petch (British Thomson-Houston Co., Ltd.) in a paper which he recently presented to the Utilization Section of the Institution of Electrical Engineers.

A great number of variables are involved in this form of motion. Any attempt to take them all into account mathematically would so complicate an already involved computation as to render it virtually insoluble. Accordingly the author generalized, neglecting the less important details, in order to obtain a reasonable representation—not in accurate quantitative detail, but in broad terms—of the correct relative values of the more important quantities.

# PERSONAL and SOCIAL

## *News of Men and Women of the Industry*

THE retirement is reported (on 4th January) by the *South African Electrical Review* of **Mr. H. A. Eastman,** B.Sc., M.I.E.E., city electrical engineer of Cape Town. Mr. Eastman succeeded Mr. G. H. Swingler as city electrical engineer at Cape Town in 1944, and had been acting city electrical engineer since 1940. He is a past-president of the Association of Municipal Electricity Undertakings and has represented the Association on the World Power Conference. He has also been overseas representative of the Council of the Institution of Electrical Engineers for Cape and Natal. **Mr. C. G. Downie** has succeeded Mr. Eastman as city electrical engineer.

At a meeting of the Council of the Electrical Wholesalers' Federation on 16th March **Mr. W. J. Bensley** was elected president of the Federation and chairman of the Council for the ensuing year. Mr. Bensley, who was born in 1889, joined the Sloan Electrical Co., Ltd., in 1907 and has risen successively to be Accessories Department manager, London manager, sales manager and general manager, and in 1947 joined the board as deputy managing director. He is keenly interested in the social life of the Sloan Electrical Co., having been a vice-president since the inception of the Social Club. Since 1946 he has been a councillor of the London & Eastern Section of the E.W.F.

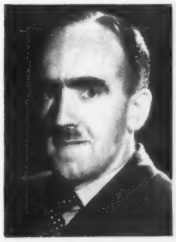
Mr. W. J. Bensley

**Mr. R. F. Wilson** has joined Thorn Electrical Industries, Ltd., as lighting representative in the Cardiff area. He was previously sales engineer in the north east area for the Liverpool Electric Cable Co., Ltd., and from 1948 sales engineer in the South Wales area for Mersey Cable Works, Ltd.

**Mr. C. H. Noton,** general sales manager of Fibreglass, Ltd., has been appointed a director of the company.

**Mr. R. L. Karnaghan,** manager of J. R. Hall & Co., machinery merchants of Melbourne, Australia, is visiting this country this month and left Melbourne by air on 4th April. He is interested in alternators, alternator sets, household electrical equipment, refrigerators, woodworking machinery (including portable electric tools), domestic and industrial hot water services, etc. His address while in this country will be c/o C. O. White & Co., Ltd., 7-8, Idol Lane, London, E.C.3.

**Mr. L. J. Forbes,** associate director of Oliver J. Nilsen (Aust.), Ltd., Melbourne, and **Mr. Stanley F. Penwarden,** production manager, Nilsen Cromie Pty., Ltd., Collingwood, Victoria, a Nilsen subsidiary, are visiting Great Britain. They will investigate the position in regard to new materials, and will also study production methods in the electrical industry on behalf of the Nilsen organization. Mr. Forbes is manufacturers' representative on the Electrical Approvals Standards Committee of the Standards Association of Australia, and is also a member of the Electrical Approvals Board of the State Electricity Commission of Victoria. Both Mr. Forbes and Mr. Penwarden will spend about five weeks in this country, and contact with them may be made through the E.S. & A. Bank, Gracechurch Street, London.



Mr. L. J. Forbes

Mr. S. F. Penwarden

In our 23rd March issue we reported the appointment of **Mr. G. R. Morgan,** A.M.I.E.E., generation engineer, operation, North Group of the South Eastern Division of the British Electricity Authority, to be responsible for the administration of all steam plant belonging to the Hydro-Electric Power Commission of Ontario.

The B.E.A. informs us that **Mr. E. D. Holdup**, M.Sc., A.M.I.Mech.E., A.M.I.E.E., superintendent of Kingston "B" power station, is also going to Canada to become superintendent of the new "J. Clark Keith" power station at Windsor, Ontario, which will commence operation this autumn. Mr. Holdup, who served his apprenticeship with the British Thomson-Houston Co., Ltd., at Willesden and Rugby, has spent fifteen years in the electricity supply industry, serving with the Central Electricity Board and later in the Deptford West and Battersea "A" and "B" power stations of the London Power Co.

The new chairman of the Radio & Electronic Component Manufacturers' Federation is **Mr. W. F. Taylor**, O.B.E., director of the Telegraph Condenser Co., Ltd. Mr. Taylor joined T.C.C. from the motor industry in 1925 and has spent most of his career with his company in looking after its sales interests. During the war he took over works management of the Acton factory and the various dispersal units. Afterwards he resumed his commercial activities as general sales manager and was elected a director of T.C.C. in 1945. He has for a number of years served on the R.E.C.M.F. Exhibition and Publicity Committee and at the present time represents the Federation on the R.I.C. Public Relations Executive.

Mr. W. F. Taylor

**Mr. L. Liddelow**, manager of the State Electricity Commission of Victoria, is retiring on 30th April.

**Mr. G. F. Gray** was elected chairman of the Northamptonshire Branch of the Electrical Contractors' Association at the recent annual meeting of the Association.

**Mr. A. Winstanley**, of Winstanley and Barnett, Ltd., electrical engineers, of Liverpool, has been elected chairman of the Liverpool Branch of the Electrical Contractors' Association for the second year.

An extension of their T. V. development organization is announced by E. K. Cole, Ltd., by the appointment of **Mr. A. Godfrey** who, working in conjunction with local Ekco representatives, will be responsible for the areas covered by the Holme Moss and Kirk O'Shotts transmitters. After some pre-war experience in the radio industry, Mr. Godfrey served throughout the war in the Royal Navy and on demobilization joined a West London stores as radio and television buyer. In 1948 he went to Ultra as television sales promotion manager. He commenced his duties with Ekco on 1st April and is based at the company's northern depot, 55, Whitworth Street, Manchester.

**Mr. R. Charles**, manager of the Leeds branch of the Simplex Electric Co., Ltd., since 1924, retired at the end of March, being succeeded by **Mr. I. M. Cameron**, who has been deputy manager of the branch.

**Mr. H. C. Jones**, O.B.E., for the last nine years telephone manager in the Liverpool area, has been appointed head of the Engineering Organization and Efficiency Branch at headquarters in London.

**Mr. R. E. Dymond** has been appointed technical director of Electropower Gears, Ltd., and is responsible for design and development.

**Dr. M. Reed**, M.I.E.E., who joined Philips three years ago as chief engineer of Mitcham Works, Ltd., has now been appointed a director of that company.

**Mr. R. E. Bristow**, M.I.E.E., managing director of B. and S. Electrical Construction, Ltd., has been re-elected chairman of the Surrey Branch of the Electrical Contractors' Association for the nineteenth consecutive year.

**Mr. C. I. Orr-Ewing**, O.B.E., M.P., has been appointed a director of A. C. Cossor, Ltd.

**Mr. E. A. Newburn**, M.I.E.E., has been appointed manager designate of the Taunton Sub-Area of the South Western Electricity Board from 1st April. Mr. Newburn has been deputy manager (engineering) of the Bristol Sub-Area. He was for some years borough electrical engineer of Walsall, and became city electrical engineer at Bath in 1946, a position which he retained until vesting day.

At a dinner last Friday to celebrate the silver jubilee of the **Whiteley Electrical Radio Co., Ltd.**, each of the sixty people present found placed before him on the table a miniature loudspeaker. Mr. A. H. Whiteley, managing director, presided. A small silver loudspeaker and an illuminated address were presented to Mr. Whiteley on behalf of the staff by Mr. D. James, production manager. Mr. P. Adorian (president of the British Institution of Radio Engineers) paid a tribute to the company.

## OBITUARY

**Mr. Charles H. Stafford**, who resigned from the general managership of Leicester City Transport last October owing to ill-health, died at his home in Leicester on 30th March. He was sixty-one. Mr. Stafford started his career as a power station engineer with Reading Corporation Tramways and after holding various posts joined the Burnley,

College and Nelson undertaking, going from there to Leicester.

Mr. **W. Humphreys.**—The death occurred on 25th March in his seventy-fifth year of Mr. William Humphreys of J. H. Humphreys & Sons, of Werneth, Oldham.

Mr. **A. H. Redfern.**—The death occurred on 27th March at the age of sixty-six of Mr. Arnold Heap Redfern, for some years the London director of Redfern's Rubber Works, Ltd.

## WILLS

Mr. **A. E. Rayner,** of Richmond, Surrey, formerly assistant secretary of the Institution of Electrical Engineers, who died on 15th January, left £8,088 gross (£6,063 net).

Sir **Geoffrey Rothe Clarke,** C.S.I., O.B.E., a former managing director of the Telegraph Construction and Maintenance Co., Ltd., and of Submarine Cables, Ltd., who died on 11th October last, left £16,965 gross (£14,362 net).

Mr. **E. H. Dixon,** B.Sc., M.I.E.E., for 23 years head of the Electrical Engineering and Physics Department of the Royal Technical College, Salford, who died on 27th November last, left £3,983 gross (£3,923 net).

Mr. **M. H. Galsworthy,** joint founder and senior director of Galsworthy, Ltd., electric light fittings manufacturers, who died on 18th August last, left £29,259 gross (£29,003 net).

Mr. **——,** manager of Cable and Wireless, Ltd., who died on 25th November last, left £5,638 gross (£5,456 net).

---

## British Association

PRELIMINARY details of this year's meeting at Edinburgh of the British Association for the Advancement of Science (8th–15th August) are now available, together with registration forms, from the Secretary at Burlington House, Piccadilly, London, W.1, or from the City Education Department, 12, St. Giles Street, Edinburgh. The Duke of Edinburgh is the president, and his address at the inaugural meeting will be entitled "The British Contribution to Science and Technology in the Past Hundred Years." This, the 113th annual meeting of the Association, is the sixth to be held in Edinburgh and for the third time a member of the Royal Family is president.

The meeting has been planned to form a part of the Festival of Britain and a large number of items in the programme will be concerned with British contributions to science since 1851, the presidential address and more than half of the thirteen section presidential addresses being in this vein. For example, in his address as president of Section G—Engineering, Sir Claude Gibb, C.B.E., F.R.S., will speak on "Two Thousand Years of Engineering."

Official Festival science exhibitions have been arranged for London and Glasgow and there will also be official travelling exhibitions. The British Association meeting in Edinburgh will be the main non-official effort to present the progress of British science through a programme of lectures, addresses and discussions in which prominent scientists will take part. The excursions and visits to works number about 150 and there will be the usual complement of social functions.

---

## MAGNETIC DICTATION MACHINE

VERY good quality of reproduction facilitates the transcription of speech dictated to the "Dictorel" machine, made by the Ateliers des Constructions Electriques de Charleroi, Belgium, which has recently become available from the A.C.E.C., 56, Victoria Street, London, S.W.1. Use is made of rectangular sheets of coated magnetic recording paper, called "dictograms," the leading edge of which is reinforced; at each end is a metal tag for engagement with recessed hooks on the recording drum to accurately position the paper, which is longer than the circumference of the drum and overlaps the leading edge.

The recording head is driven parallel to the axis of the drum by a lead screw, making a helical magnetic track 1 mm wide and of 1·27 mm pitch at 8 cm/sec recording speed. The paper is continuously held against the drum by three fixed external spring clips, which are felted to cause sufficient friction to keep the paper in register against the retaining hooks. There is no audible click when the trailing edge of the paper passes the sound head. Exact re-registration of the tracks at the overlap is automatic, as has been demonstrated, if the paper sheet is removed and replaced. Each sheet suffices for twelve minutes' recording time.

A loudspeaker is built into the machine, which has the usual means of starting and stopping from a little distance by foot pedal or press switch. A back-stepping control moves the sound head back one turn of the spiral trace, equivalent to 4 sec, for each movement of the press button or pedal. The head can also be moved back quickly by hand when long repeats are needed.

The equipment contains four valves and the frequency of the erase and bias current is 30 kc/s. About 1 W output is available to the loudspeaker and power consumption is about 45 VA at 110, 130, or 220 V from 50 to 60 c/s mains.

The dimensions of the machine are 15¾in by 13½in by 6in high and its price is £85 with dictation accessories, or £82 with equipment for transcription. Spare recording sheets cost £2 3s for ten, or £3 18s for twenty.

# VIEWS on the NEWS

## By REFLECTOR

AS one who has been much exposed to orators, I wish to enter a gentle protest against the tendency of after-dinner speeches at electrical functions to be too long and too many. The number is the fault of the organizers; the length is a failing of the speakers who would often be really good if they compressed their points into smaller compass. Many of the people who attend dinners have had a long and hard day and they look forward to some relaxation and social converse—and maybe entertainment. It is unfair to subject them to two or three hours of oratory.

* * *

Mr. A. L. Burnell, the secretary of the South Eastern Electricity Board, tells me that he is not so sure that he lost any goodwill by pointing out that his Board's contribution to the Cuckfield (Sussex) rates was compulsory not voluntary. Some people had interpreted it as a typically spendthrift gesture by a nationalized industry. Mr. Burnell does think, however, that he may have gained some goodwill from consumers who would not have appreciated beneficence at their expense.

* * *

I have had a letter from Mr. D. H. S. Sanderson, of Roundhay, Leeds, on the subject of power cuts and have passed it on for publication in the "Correspondence" section. Mr. Sanderson, who rather naturally disagrees with a recent statement that most consumers have been inconvenienced very little by load shedding, seems to have suffered rather badly. I presume that other consumers in his district must have shared his unhappy experience and I can only hope that this is an exception attributable to special circumstances.

* * *

A *Reuter* report from Oslo says that a drought has badly affected power supply in West Norway. Industry in the fishing port of Kristiansund came to a standstill last week and power supplies have been cut to all but vital services. The report adds that the baking of cakes has been forbidden during the crisis. This is the sort of regulation which we might expect in this country. It places a great deal of reliance on the public spirit of the consumer.

* * *

I believe that it was largely the example of the gas industry which caused electricity supply undertakings to adopt schemes for the simple hire of appliances to their consumers. Hiring was necessary if electricity was to compete successfully with gas, although most undertakings would have preferred to confine this kind of business to hire-purchase and so limit their responsibility for appliances to a definite period. Now, as I have already remarked, most of the Electricity Boards are endeavouring to divest themselves of further liability under hiring schemes. Electricity may possibly be at a disadvantage if its hire schemes are wound up while those of gas are maintained. I see from the Gas Council's first report that the Gas Boards are, at least, not extending the range of simple hire, but that is not the same as discontinuing it.

* * *

Last week it was reported with great gusto that the Eastern Gas Board had installed a street lamp outside the Thetford office of the Eastern Electricity Board and that somebody from the Gas Board had said that "it might be useful to them during power cuts." The Electricity Board people might agree, provided there were enough pressure, but what I want to know is what do many gas showrooms do for lighting during power cuts?

* * *

In presenting its estimates the United States Defense Electric Power Administration says that electrical utilities could save from 75,000 to 100,000 tons of copper annually by using aluminium as a substitute —if the aluminium were available. As it is, I presume, they are saving aluminium instead.

# CORRESPONDENCE

*Letters should bear the writers' names and addresses, not necessarily for publication. Responsibility cannot be accepted for the opinions expressed by correspondents.*

## Electrical Vector Diagrams

I AM afraid I must join issue with my friend Mr. Edgley over some of his comments (*Electrical Review*, 23rd March) on Mr. Scroggie's excellent article (9th February issue).

Mr. Edgley properly points out that what we usually call electrical vectors are not really vectors in the mathematical sense. Some Chinese writers (in America) have proposed the names "sinor" and "complexor" for "vector" currents and voltages and for complex impedances respectively. This practice does not seem to be favoured in this country at present and is mentioned only in passing.

Unlike Mr. Edgley, I find no difficulty in dealing with electrical vectors in the way described by Mr. Scroggie, i.e., that the vector $xy$ has its origin at $x$. This fits very well with the voltage rise concept, so that $V_{ab}$ rises from $a$ to $b$ and $I_{ab}$ flows from $a$ to $b$. Like Mr. Bennet (*Electrical Review*, 16th March) I am strongly in favour of the use of voltage rises only; to postulate a voltage drop as a positive thing seems to me quite unnecessary. One does not have two kinds of current, why two kinds of voltage?

Although the adoption of a "positive" sense for alternating quantities is only a convention, I think most people find it a very useful one and it seems to me that the assumption must be implicit in any convention stated, if ambiguity is to be avoided.

I cannot follow Mr. Edgley's arguments in the use of single subscripts. According to any normal interpretation, $V_a + V_c$ means the voltage of point $a$ relative to some reference point ($x$ say) added to the voltage of point $c$ relative to the same reference point, i.e., $V_{xa} + V_{xc}$ according to Mr. Scroggie's (and my own) preference, or $V_{ax} + V_{cx}$ according to Mr. Edgley's previously stated preference. In either case the sum is not equal to $V_{ac}$.

I assume that Mr. Edgley does not in fact wish $V_a + V_c$ to be interpreted as $V_{ax} + V_{xc}$ (in his notation), but that his second expression is merely intended to indicate that if one obtains the voltage from $a$ to $c$ through $x$ or $b$, or any other points, these points can be "cancelled" out of the continuous chain in arriving at the final result. Clearly this is so, and is equally so when the opposite convention is used.

*Harlesden, N.W.10.* G. LYON.

I AM grateful to Mr. Bennet (*Electrical Review*, 16th March) and Mr. Edgley (23rd March) for commenting so interestingly on my article (9th February). Their reactions are more favourable than I had been prepared to expect. Neither has any objection to the form of vector diagram I proposed. One of its strongest points, in fact, is that it remains unambiguous even when there is disagreement over whether to reckon in "rises" or "falls." It is only when naming the voltages that the difference emerges.

Mr. Edgley, who may be said to represent the orthodox viewpoint, prefers the "fall of potential" notation, whereby $V_{ab}$ signifies the voltage of $a$ with respect to $b$. Since the arguments between this and the opposite convention are fairly evenly balanced, I presented both in some detail before finally indicating a preference for the "rise." My argument in favour of it was not the result of confusing the electrical "vector" with the mathematical vector—for I had specifically mentioned that any relationship between the assumed direction of a voltage and that of the "vector" representing it would be purely coincidental—but did give weight to the advantage as a mental aid of having them agree. Mr. Edgley admits the anomaly, with his notation, of calling a voltage represented by an arrow pointing from $a$ to $b$ $V_{ba}$; and I admit that the opposite notation involves circuit ideas that take a little getting used to if one has been brought up in the strictly orthodox tradition. Until one convention or other has become universally adopted, therefore, it would seem advisable for anybody who uses the double-subscript notation to indicate at the start whether $V_{ab}$ is to mean the voltage of $a$ with respect to $b$ or the voltage in the direction $a$–$b$.

So far from seeking to restrain me at any point, Mr. Bennet drives right past the apology with which I thought it wise to suggest treating a resistor as if it were a source of e.m.f. — IR, and unhesitatingly states a case for — IR actually being an e.m.f. Although most of the textbooks I have come across are surprisingly vague about the distinguishing properties of an e.m.f., and none I have yet seen has committed itself plainly, even with regard to a charged capacitor, I feel that Mr. Bennet's concept necessitates an extension of the commonly-understood meaning of the term e.m.f. and might not be acceptable to some who would be prepared to go as far as I do. The differing views which exist on the precise nature of e.m.f. do however seem to me a strong argument in favour of the version of Kirchhoff's Law ($\Sigma E = 0$) which does not necessitate drawing a distinction between voltages that are e.m.f.s and those that are not.

I am afraid I cannot see how Mr. Edgley avoids ambiguity with his notation for currents. How does $I_a$ indicate direction of current and, if there is more than one path from *a* to *b*, how does $I_{ab}$ indicate which?

*Bromley, Kent.* M. G. SCROGGIE.

## Protective Earthing

I HAVE noted your editorial comment on the recently published E.R.A. technical report (V/T 106) and share your admiration for a most complex and involved attempt to evaluate the economics of leakage protection. In view of the large number of assumptions necessary, however, I cannot agree that this publication takes us even one step towards more efficient leakage protection.

As Mr. Gosland has agreed, no consideration of fire risk associated with persistent earth leakage, which is considerable and increasing with installation loadings, has been given, but only shock risk, which is by comparison almost negligible. Factory Department reports have for years stressed this aspect of leakage protection, but reports of investigations continue to appear in which the matter has been completely neglected.

Nor has the important time factor received the attention it deserves, except in respect of minutes in connection with fuse operation. A minute is far too long to wait for the operation of protective devices, and may make all the difference between a short harmless leakage and a serious fire or a fatal accident.

As a previous E.R.A. report has considered that the fire risk with P.M.E. may be greater than with direct earthing, any serious investigation into protective problems cannot afford to neglect this aspect, unless it is content to remain of academic as opposed to practical value.

T. C. GILBERT, M.I.E.E.

*Folkestone.*

## Installation Costs

FAR be it from me to begrudge electricians their rise in wages but I wonder if they have considered what will be the ultimate result of such wage increases.

The cost of electrical materials and apparatus is continually rising steeply and a dangerously false position is being created. No electrical contractor is at present in a position to quote fixed prices for anything and people who require electrical work done will now think twice before they place an order. This will simply mean that there will be less work for electrical contractors and a sharp rise in the unemployment figures.

If I am looking at this matter from a pessimistic point of view perhaps someone will be good enough to tell me and I will be delighted if I am proved incorrect.

*Glasgow.* A. MILNE, SENR.

## Power Cuts

IN his notes in your 16th February issue, "Reflector" remarked on the tendency of the lay Press to make too much of the hardships inflicted on electricity consumers as a result of load shedding and reported that Mr. E. Braathen had said that the most unfortunate consumer (presumably in Birmingham) had been deprived at various times of a total of 3½ hours only during the winter.

I regret that I have to disagree with this and am of the opinion that, but for the lay Press in Yorkshire, some of us might still have had in the second half of the winter a similar experience to that in October, November and December. Fortunately, things have not been quite so bad.

I live in a suburb of Leeds. All our cooking is done by electricity; I have "preached and practised" domestic electrification for nearly 30 years and I think

that we in this part of the country have suffered excessively compared with other parts, particularly with the London area. Very many people have had gas lighting installed while I have had to buy and use a paraffin vapour lamp for lighting.

During October, November and December load shedding at my house amounted to nearly 50 hours; on six occasions for over two hours, on sixteen other occasions for periods of over one hour, whilst the "juice" was off before 8.30 a.m. no fewer than 19 times in those three months.

On 4th December—Monday, "wash day"—the cuts at my house were from 7.50 to 9.20 a.m.; 9.30 to 11.55 a.m.; and 3 to 5 p.m. On the following Monday they were from 7.50 to 8.55 a.m.; 9.25 to 12 noon; and 4 to 5 p.m.

I enclose for your interest a "Rota of Load Shedding" for Leeds, which was issued by the Yorkshire Electricity Board. I live in Group A. I have marked in red the occasions on which cuts took place in October, November and December, from which you will see that there were cuts on 27 days.

*Roundhay, Leeds.* D. H. S. SANDERSON, A.M.I.E.E.

# RESEARCH REPORTS

AMONG the recent publications of the British Electrical and Allied Industries Research Association is a report (Ref. L/T237) on "Tracking in Solid Insulating Materials: Method for Testing Susceptibility to Tracking," edited by V. E. Yarsley, D.Sc., F.R.I.C., F.P.I.

The investigation described in this report began with a critical examination of the existing methods of test in the light of inquiries of Refs. L/T177 and L/T228 and as a result of this a revised test is now proposed for general adoption. Both the method and apparatus are similar to those of the Detroit Edison and Admiralty tests, since these have been found to give more discriminating and reproducible results, in a more convenient manner, than any other tracking test investigated. Certain modifications and refinements are made, however, which it is believed will widen the usefulness of the test and make the results more reproducible and significant.

Copies of the report are available from the Association at Thorncroft Manor, Dorking Road, Leatherhead, Surrey, price 6s, postage 3d.

## Losses in Sheet Steel

In a report (Ref.: N/T60) on "Losses in Electrical Sheet Steel" (E.R.A., price 7s 6d, postage 3d), Mr. K. H. Stewart describes work which has been carried out at the Cavendish Laboratory, Cambridge, under the direction of Dr. D. Shoenberg.

Various experiments on the magnetic losses in sheet steel in the power range of frequencies and flux densities are described and their interpretation discussed. An attempt is made to decide whether modifications to eddy current theory could account for the observed frequency dependence of loss in the particular case of low-loss silicon-iron sheet, and if not, to investigate the other mechanisms causing loss.

It is concluded that the frequency-dependent part of the loss in sheet steel cannot entirely be accounted for by the classical eddy current mechanism. In many cases modifications to this mechanism caused by variations in permeability can account for most of the loss, but a part of the loss, becoming very important in low loss sheet, must be attributed to some other cause. The extra loss appears to be due to the slowness of domain wall movements, although it is not clear whether this is caused by microscopic eddy currents or by some other form of friction.

# GAMMA-RADIOGRAPHY

DURING the past year several new developments have taken place in the practice of gamma-radiography, the most important of these being the ease with which artificial radioactive substances have become available from the Atomic Energy Research Establishment at Harwell. In a paper entitled "Gamma-Radiography in Shipbuilding and Engineering" to the Institute of Marine Engineers Mr. J. D. Hislop mentioned the fact that the introduction of three radioactive sources for industrial work, cobalt, tantalum, and iridium had rendered the use of radium obsolete, although radon was still of some value in certain cases. These isotopes are produced after the neutron irradiation of the natural elements in the atomic pile, when elements of the same chemical properties but different atomic weight are the result. The useful isotopes are those of mass-number 60, 182 and 192 respectively.

Mr. Hislop described gamma-radiographic technique and application and indicated the various factors which governed the choice of a suitable source. He also discussed the problem of the safe handling of sources and of personnel protection.

# Scottish Staff College

## *Courses for Hydro-Electric Engineers*

ANOTHER group of junior engineers who will man hydro-electric stations in the North of Scotland began training in the Hydro-Electric Board's Staff College at Faskally House, Pitlochry, Perthshire, this month.

They are the fifth intake to be enrolled for training since this residential College was established two years ago. The first three intakes are already on duty in the control rooms of hydro-electric stations at Loch Sloy, Pitlochry, Clunie, Tummel Bridge, Rannoch and the Dundee steam station.

The Staff College* owes its conception to Sir Edward MacColl, deputy chairman of the Board, who visualized it not only as a place where young engineers could complete their training, but also as an essential step in the recruitment of technical staff for the Board, an educational centre where the recruit would not only receive instruction on the specific duties required of him in the new hydro-electric stations, but also gain a knowledge of the whole organization and the economic background of the 21,750 square miles of Scotland in which the Board is responsible for generation, transmission and distribution. That was the basis of the training scheme. The execution and supervision were placed in the hands of Professor S. Parker Smith, C.B.E., D.Sc., who relinquished the Chair of Electrical Engineering at the Royal Technical College, Glasgow, to superintend the training scheme. The present tutorial staff brings to the task not only high technical qualifications, but also wide experience of electricity generation and supply in the Board's area.

Faskally House is a Victorian mansion in a beautiful setting in the wooded valley of the River Tummel. It is ideally situated for its purpose. To the junior engineers in residence, hydro-electric development is not a subject studied from afar. The candidate on arrival at the College finds himself in the centre of the biggest hydro-electric scheme in Scotland. At the front lawn is Loch Faskally, the storage reservoir formed by the Pitlochry dam three miles away, and across its placid water stands Clunie generating station fed from the Clunie dam two miles upstream. Farther up the valley are the pre-war hydro-electric stations of the Rannoch and Tummel schemes, built by the former Grampian Electricity Supply Co. and within easy reach are areas where constructional work on other hydro-electric schemes has started, or will soon be starting.

**Electrical Review*, 6th February and 5th March, 1948.

Men are selected for training from applicants who have a university degree or a technical college diploma in engineering, or who have passed the Higher National Certificate examination in electrical or mechanical engineering and, in addition, have had an approved practical training.

The Selection Committee which interviews the applicants does not confine its inquiries to technical qualifications and experience. Its members have also to decide whether the candidate is suitable for the conditions peculiar to the Board's area. His job might require him to live in an isolated district and a man who would be an excellent engineer in a city power station might not possess the temperament which would allow him to settle in an isolated Highland glen. Not only has the candidate himself to be considered. If he is married or engaged, he is asked what are the views of his wife or fiancée; would she be happy to live in a small remote village? This is particularly important, because on this matter women's views do not seem to be neutral. They like the country, or they dislike it—the compromise of a summer holiday is meaningless. The prospect of living in the remote parts of the Highlands does not deter applicants; on the contrary, the number of applicants has greatly exceeded the requirements; there were 85 applicants for the ten places available in the fourth intake.

The successful trainee's pay during training is £300 per annum, less three guineas per week for board and lodging, rising to £375 per annum on a first probationary appointment. The young engineer is eligible for the Hydro-Electric Board's superannuation scheme, subject to a medical examination, after a probationary period of not less than six months. Salary increases then follow national scales.

The curriculum of the College includes the subjects which are applicable to the candidates' job. The basic course is power generation and is preparatory to shift work in generating stations. The introductory lecture covers the whole electricity supply position in the North of Scotland, the Board's constitution, powers and duties, and the legal procedure governing the promotion of hydro-electric schemes. The economic section covers basic principles and conditions affecting steam, diesel and hydro stations. The plant and machinery section of the syllabus starts with rainfall and other physical factors, covers the design of power schemes and takes the trainees through alternators, hydraulic turbines, transformers, voltage regulators, switches and switchgear to system layout. The operation of power stations is an important part of the curriculum. Engineers are recruited for distribution from ex-trainees from the College; consequently, long distance transmission and distribution with particular reference to the problems of the North of Scotland are also included.

In the normal way the engineer under training will attend the Staff College for twelve months, but this is subject to operational demands. The course is divided into periods consisting of six weeks in the College and six weeks on operational duty at hydro-electric stations, such as Clunie, Loch Sloy, Rannoch, the centre control room, steam stations at Dundee and Aberdeen and the diesel station at Rothesay. While in residence, the junior engineers go on conducted tours to Clunie, Pitlochry and Loch Sloy hydro-electric stations, to switching stations and to establishments engaged in the manufacture of electrical

**One of the classrooms of the North of Scotland Board's Staff College at Pitlochry**

and hydraulic plant for the Board and to hydro-electric schemes under construction. Thus the junior engineer during his training is able to trace the development of plant from the design stage to its completion and commissioning in the power station.

In general, this training procedure is followed by all technical recruits irrespective of the department to which they may ultimately be attached. Most of the junior engineers have been electrical engineers, but recently, to meet the requirements of the Board, a fair number of mechanical engineers have been enrolled. It is found that they are able to keep pace with the other trainees without difficulty.

By keeping the classes small, it has been possible to achieve almost individual tuition and there is an informal atmosphere in the lecture rooms. Trainees are encouraged to ask questions and discuss points which arise during the lessons. An extensive technical library has been built in the College in which emphasis is placed on the special needs of the Hydro-Electric Board. Advantage is taken of new visual aids to education, such as films and filmstrips where appropriate.

Life at the College is not all work. Health is all-important. There is a playing field beside Loch Faskally and a badminton court in what was at one time the ballroom of the mansion house. Hill climbing attracts many of the engineers in residence during the week-ends. The College has a workshop equipped with power driven tools which is at the disposal of the engineers.

This residential College is an interesting experiment in technical education which is already proving of value. A tradition and team spirit are being built up which should be of increasing value as time goes on.

---

# STREET LIGHTING NOTES

A TRUNK road lighting system installed by the North Western Electricity Board at MACCLESFIELD covers three miles of the main Stockport–Potteries A523 road previously lit by gas lamps. The scheme embodies both fluorescent and sodium type lighting, the former being confined to the main shopping centre, and the latter to the approaches to the town. The whole installation was completed in six weeks.

The Minister of Transport has withheld from BIRKENHEAD Corporation £4,300 in grant for new lighting. The Minister is of the opinion that a new and more expensive system of fluorescent lighting at Woodside Ferry Approach, and the conversion to fluorescent lighting in Grange Road West, Oxton Road and Charing Cross, cannot be justified at the present time. Arrangements are to be made for the Ministry's engineer to visit the areas to observe the need for improved lighting.

LIVERPOOL Corporation Lighting Committee, whose estimates for the forthcoming year have been cut by the City Council by £12,500, has decided to defer the improvement of dock road lighting and make other economies.

The Ministry of Transport has approved the installation of improved electric lighting along the trunk road at BRIDGWATER from the former Somerset and Dorset Railway station to the borough boundary.

SCARBOROUGH Town Council has received formal Ministry of Health sanction to borrow £5,960 for providing street lighting at Eastfield.

**Fluorescent lighting near Macclesfield Town Hall**

# Training Radio Engineers

## *B.B.C. College at Evesham*

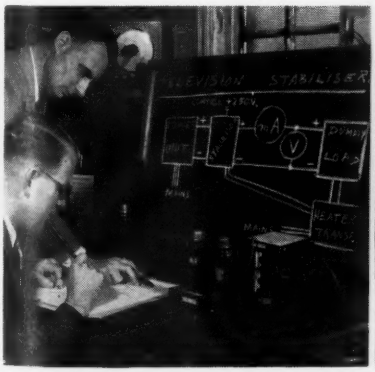
WHEN we visited the Engineering Training Department of the British Broadcasting Corporation at Evesham, Worcs, recently we saw how engineers and technical assistants are instructed in the theoretical and practical aspects of B.B.C. technique and equipment for the sound and television services. No attempt is made to give basic training in electrical engineering, as this is available elsewhere, but attention is concentrated on the application of basic principles to the equipment and methods used in the B.B.C. Students are encouraged to undertake courses of study on their own initiative so that their standard of attainment in mathematics and physics will enable them to make the fullest use of the courses provided.

During the war the B.B.C. was faced with a serious loss of trained staff to the fighting services, and in 1942 the Engineering Division started a scheme of intensive training of engineers from other branches of electrical engineering. When this source was exhausted the training of youths and women operators was instituted. The Training Section responsible for this work was then a part of the Operations and Maintenance Department.

There was a central school in London and a number of smaller ones in the provinces. At the central school one month's preliminary training was given in the laws of electricity, acoustics and radio propagation, but in the provinces the students spent two months in lectures and operational work on the apparatus which they were eventually to handle. Training was given on transmission, control room and recording apparatus, and about 2,500 students passed through during the war. In addition to these schools, at a number of the larger stations and regional centres instructors were appointed to bring the youths and women recruits up to a standard suitable for them to profit from the instruction given at the school. In 1945, the present head was appointed and the section was elevated to the status of a Department.

It was realized that separate schools and station instructors were uneconomical and could not provide the proper facilities needed for full-scale training. Following the appointment of Dr. K. R. Sturley to the staff of the Engineering Division in 1945, it was decided to centralize the whole Department and this was done at Wood Norton Hall, Evesham, in March, 1946. The total number of students who have passed through the Wood Norton School is 1,100

*Left*: **Experimenting on h.v. stabilizers in the television laboratory.** *Right*: **Testing a frequency modulation transmitter**



and during the past five years considerable developments have taken place in training for the sound and television services.

Formerly there was only one official television instructor, but it was soon realized that this was quite inadequate for coping with the demands for trained television staff, and the whole department is now engaged on television teaching, as well as sound. Since the correct presentation of principles and facts is a most important aspect of training, it was natural to make the writing of technical instructions and manuals on new equipment the responsibility of the Training Department, a section of which is entirely devoted to this work.

## Engineers and Technical Assistants

The main activity of the Department has centred on two types of staff: the new recruit, who enters as a technical assistant, and the engineer. The engineer is generally, though not always, a former technical assistant with some years of experience in B.B.C. work. The technical assistant operates the apparatus under supervision, while the engineer may be concerned with supervision of technical assistants and the maintenance of apparatus, or with development, design, research or engineering administration.

An important development has been that of refresher courses for senior staff, and these have concentrated on the presentation of new developments and techniques. Training has also been given to non-engineering staff, known as programme operators, who are responsible for the technical control and balance of the programme output from the studio. On the engineering side there are five types of courses: initial entry, promotion, refresher, conversion and workshop.

Under the head and assistant head of the Department there are three main branches: instruction, instruction writing and general management. The three instructional sections—fundamentals, audio frequency and radio frequency—are each in charge of a senior instructor. In the fundamentals section there are four instructors under the senior instructor who are concerned with teaching the fundamentals of electrical engineering and radio measurements, physics (light and sound), and with mathematics. In the audio frequency section three instructors deal with studio control rooms and recording practice, line and network theory, and there is an instructor in acoustics for training programme operators. In the radio frequency section there are three instructors who deal with transmitters, camera tubes for television, and wideband amplification with particular reference to pulses and transients.

Instruction in broadcast engineering requires a specialized approach, because radio engineering, of which it is a part, normally calls for a very high standard of mathematics and technical knowledge. One of the important problems faced by the Department has been to select and present this technical knowledge so that it can be readily understood by staff whose duties do not normally require a wide mathematical background. This has necessitated an entirely fresh teaching approach, in which demonstrations by lecturers and practical work in the laboratories by students play a large part. Each section of the work is simplified to bare essentials and the mathematical representations are replaced by pictorial explanations. When the intermediate steps cannot be satisfactorily treated in this manner, the subject is analysed on a cause and effect basis. Many of the lecturers have had long experience in the Engineering Division, and a keynote of their teaching is linking new techniques with the past experience of the students.

## Accommodation Facilities

The premises occupied are the main house built by the Duc d'Aumale, fourth son of Louis Philippe, and enlarged in 1891 by his nephew, the Duc d'Orléans, claimant to the throne of France. This is used for classrooms, laboratories and offices, and an extension has been made by building a number of studios and the transmitter laboratory. In adjacent buildings and huts are more laboratories, one containing a complete recording and reproducing channel. The students' dormitories can accommodate up to 100 in two-bedded rooms. There is a large rest room and a well equipped sick bay with two wards and accommodation for the resident nurse. The canteen comprises kitchens, stores and a large dining room capable of seating all students and staff at one time.

The Duc d'Orléans maintained a small collection of wild animals including polar bears, the tank for which is now used as a swimming pool and a source of water for fire fighting.

# Artificial Three-Phase System

*Development from Single-Phase Supply*

THE patented static system of single-phase to three-phase conversion developed by the Westinghouse Brake & Signal Co., Ltd., is essentially an inductance in series with a condenser connected across the terminals of a single-phase supply. A three-phase load can then be connected to output terminals constituted by the two supply terminals and the point of junction of the inductance and the condenser. By suitably proportioning the inductance and the capacitance, the voltages can be equally displaced in phase by 120 deg. This circuit is suitable only for fixed loads, otherwise there is a danger that series resonance may develop and blow up the whole installation.

The problem of adjusting the values of inductance and capacity to suit varying loads is met by connecting a further inductance in parallel with the condenser, the operating flux density in the inductances then being so proportioned that their values change as the load varies. The condenser and parallel inductance behave as a condenser whose capacity varies with the change of load. In practice, the two inductances are wound on the outer limbs of a three-phase transformer core; the middle limb, corresponding to the mains phase, carries no winding. Oscillograms record an entirely satisfactory voltage waveform in the output from this circuit, and a phase balance of the order of 410/410/415 V is readily obtainable.

## Standard Units

Specifications are modified for certain applications but the standard industrial 4 kVA convertor consists of two separate units, each fitted with a sheet metal cover protecting all live parts, a subdivided condenser section and an air-cooled transformer unit. As oil immersion or forced draught cooling would be needed for individual ratings above 4 kVA, standard 4 kVA units are connected to operate in parallel when higher outputs are required; such multi-unit installations are extremely flexible if later increases in loading are contemplated. Multiplication of the units causes no significant lessening of efficiency, since each convertor operates at all loads with the very low loss of about 200 W.

A 200/240 V single-phase input can be converted directly to a 400 V three-phase output by using the phase convertor as an auto-transformer, the 4 kVA rating then becoming 3 kVA. If the supply voltage is other than 400/440 V the general practice is to employ an auto-transformer to step up or down, as the case may be, the supply voltage to 400/440 V single-phase to feed the convertors and thus obtain the full rated 4 kVA output from the equipment.

## Motor Starting

In planning an installation consisting of a number of motors of various sizes it is necessary to consider the starting requirements of the largest motors, it being noted that if an overload is applied to a convertor even only momentarily, the third phase will fall away until the overload is removed. The number of phase convertor units connected in parallel must therefore have sufficient output to handle this high starting current. It is obvious that when the large motor is running, a considerable amount of power is available to operate other motors. This can be illustrated by the example of an installation for Hunt & Co., Ltd., Bournemouth, where the largest motor is a 30 h.p. induction motor with a star-delta starter. This motor needs twelve 4 kVA units for starting, but they are also operating 180 h.p. of 7 and 10 h.p. motors.

Weymann Motor Bodies, Ltd., at Weybridge, employ 12 convertors to operate three-phase motors totalling 250 h.p. for woodworking machinery, and conversion outfits are now operating several passenger and goods lift installations. Two other installations for non-rotating loads combine Westinghouse phase convertors with "Westalite" rectifiers; three-phase convertors and an auto-transformer are operating one 400 V three-phase plating rectifier supplying 7 V at 1,000 A to chromium plating vats from 230 V, single-phase mains; and a single convertor operates a three-phase rectifier at the Scala, Worcester.

# Radio Astronomy

*Discoveries by the Use of New Techniques*

WHEN he delivered an informal lecture on radio astronomy at an I.E.E. Radio Section meeting in London recently, Dr. A. C. B. Lovell explained that during the last few years the application of radio and radar techniques had led to important discoveries.

In 1931, Jansky discovered that radio waves were reaching the earth from outside the solar system and for some time it was believed that these radio emissions were generated in the interstellar gas. The application of interferometric radio techniques, however, led to the discovery of localized sources or radio stars, the feature of which was that the intense radio stars could not be identified with any bright visible stars, neither could any radio emissions be detected from the bright visible stars. It was now thought that the galaxy contained as many radio stars as visible stars. Recently, by using a large paraboloidal aerial system it had been possible to measure similar radio emissions from the extra-galactic nebula in Andromeda, 750,000 light years away.

## Interference with Communications

The sun also emitted radio waves which were especially intense when there were sunspots on the surface. The intense radio emissions from the solar flares were the forerunner on the earth of the corpuscular streams which disrupted the ionized layers 24 hours later, making long-distance communication impossible. The aurora borealis which accompanied these disturbances could now also be studied by using pulsed radar techniques. The greatest use of the pulse and c.w. radar techniques, however, was in the study of shooting stars or meteors. A vast series of meteor streams active only in the summer daytime had been discovered, and the development of radio diffraction techniques for the measurement of velocities had enabled many problems in meteor astronomy to be settled. The study of the behaviour of the ionized column left by meteors also enabled the conditions in the E-region to be studied and much new information about the physical and meteorological conditions was being obtained.

In conclusion, Dr. Lovell said that by the use of milli-second pulses and large aerial systems it was possible to observe signals reflected from the moon. When these observations could be made systematically, an important new technique would be available for study of the lunar surface and of conditions in the earth-moon space.

The discussion which followed was largely devoted to radio stars. One speaker gave details of work that had been done at Cambridge, using the interferometric type of radio telescope. This consisted of spaced Yagi aerials which received the emissions simultaneously, the polar diagram being an interference pattern made up of a fan- or shell-shaped group of narrow lobes. By using the directional properties of this arrangement, about 50 localized sources of emission, or radio stars, had been resolved in the northern hemisphere, but there were also myriads of smaller sources, the positions of which could not be defined because they produced a continuous integrated noise in the receiver. Although it seemed probable that radio stars were stars in the process of either formation or disintegration, and were consequently not visible, four of the more intense sources of emission had now been identified with visible bodies. This speaker confirmed the lecturer's statement of the existence of extra-galactic radio emissions, but said that most radio stars detected were in our own galaxy, the Milky Way.

In reply to a question about the twinkling, or fluctuations in intensity, of radio stars, the lecturer said that this was not caused by variations in the source of emission. Experiments had shown that it came from disturbances in the F-region of the ionosphere affecting the radiation by a diffraction process as it passed through. These fluctuations, which amounted to about 10 per cent of the intensity of the source, provided a valuable means of studying the movements of the F-region disturbances caused by winds in the ionosphere. It seemed also that the troposphere had a similar effect on the emissions.

# Commerce and Industry

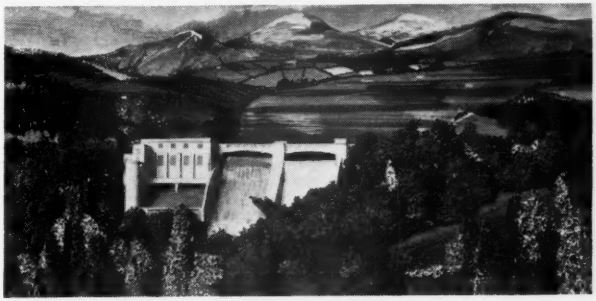
## *F.B.I. Annual Report*

## *Television Relay at Gloucester*

THE annual meeting of the Federation of British Industries is to be held on 11th April. In the report for 1950 to be presented at the meeting the Grand Council refers to the worsening of the international situation and says that British industry is now called upon to devote a considerable part of its resources to defence production. Dislocation and shortages are inevitable, and great skill and ingenuity will be required in order to make the best use of the resources we possess. The report demonstrates the very wide interests of the Federation in industrial, economic, financial and educational matters. In the matter of electric power supply the Electricity Panel of the Fuel and Power Consumers' Policy Committee submitted to the Industrial Tariffs Sub-Committee of the B.E.A. a memorandum on industrial tariffs. The Authority has agreed to circulate the Federation's views to the Area Boards. Contact is being made with industrial representatives on the Electricity Consultative Councils to find out the usefulness of the present arrangements for safeguarding consumers' interests and any ways in which they can be improved.

### Dundee Electrical Exhibition

"Festival Electric" which the North of Scotland Hydro-Electric Board is presenting in the Caird and Marryat Halls, Dundee, from 10th to 14th April, is designed to capture the spirit of the Festival of Britain by bringing together the largest and most up-to-date collection of British made electrical appliances ever exhibited in Scotland, and at the same time to stress the efficiency and economy of modern electrical apparatus. The exhibition, in which more than forty electrical manufacturers are co-operating, touches practically every sphere in which electricity serves the community. It will be dominated by a 60ft model of a dam and power station—the largest working model ever shown at an exhibition in this country. Further smaller working models and photographs will continue the story of the Board's developments.



**Model of a dam and power station which is being shown at the Dundee Festival Exhibition**

### "Standards" Exhibition

This year the standardization movement in Britain attains to its golden jubilee. Part of the celebrations will be an exhibition at the Science Museum, South Kensington, which will indicate graphically the benefits to be derived from standards, standardization and simplification of production in various industries, with consequential reduction of cost and maintenance of quality of products. Special features of the exhibits will include apparatus used in testing for compliance with British Standards requirements. The exhibition will be opened by the President of the Board of Trade on 18th June and admission will be free, daily, 10 a.m. to 7 p.m., for ten days.

### Magnesium Supply

The Minister of Supply will assume responsibility for the supply and distribution of all virgin magnesium in the United Kingdom from 1st May. To enable the Ministry to assess the requirements of industry consumers of virgin magnesium will be required to provide information of stocks at 31st March, consumption during the first quarter of 1951 and estimated requirements in April and May. This information is required by 10th April and similar information will subsequently be required each month. Known consumers will receive a form for this purpose. Those not receiving the

UNIVERSITY OF MICHIGAN LIBRARIES

form should apply to the Ministry of Supply, M.2 Branch, Room 948, Shell Mex House, Strand, London, W.C.2.

During April consumers can obtain their supplies, as far as stocks permit, from Magnesium Elektron, Ltd., Clifton Junction, Manchester. They may apply direct or, if preferred, through the Ministry of Supply.

## Middlesbrough Installation Work

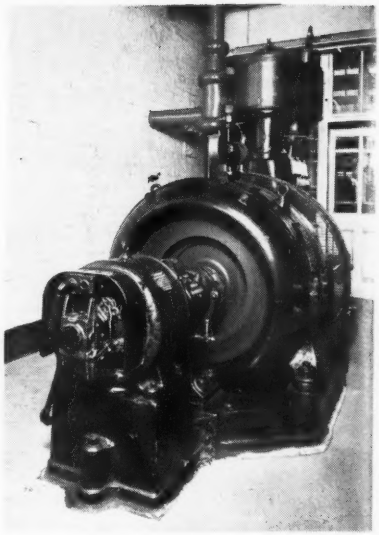
The Electrical Contractors' Association has protested to the Ministry of Local Government and Planning that Middlesbrough Corporation is allocating electrical work to the North Eastern Electricity Board and electrical firms are not allowed to tender. The Town Council has informed the Ministry that it cannot see any reason for altering its present system. The question of the prices submitted by the Electricity Board is to be considered by the Corporation Housing Committee, but in the meantime the figures are not being made public.

## Transmitters for South Africa

The South African Broadcasting Corporation has for some time been engaged on enlarging and improving its service, and, in continuance of this policy, it has now placed an order with Marconi's Wireless Telegraph Co., Ltd., for two further 5 kW medium-frequency broadcasting transmitters, Marconi Type TBM.672. This order was obtained in face of keen international competition. The transmitters will be installed at the S.A.B.C.'s broadcasting stations at Maraisburg and Welgedacht. This brings the total of Marconi 5 kW transmitters ordered in recent months by Union authorities to eight.

## A Long-Service Alternator

A 100 kW 428 r.p.m. alternator built by Lancashire Dynamo & Crypto in 1909 for a 2,750/3,000 V, 3-phase, 50 c/s supply, and used originally by a colliery company, has prompted a letter of appreciation from its present owners. Mr. R. de la Cour, manager

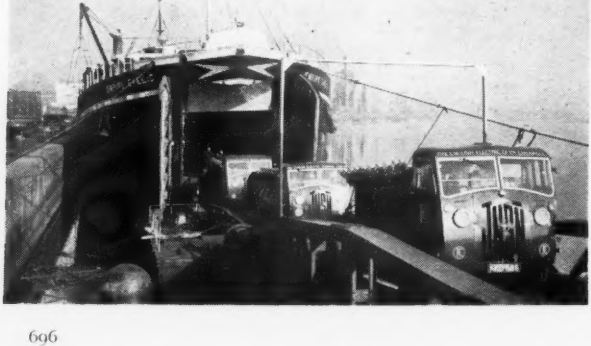


**A Lancashire Dynamo & Crypto alternator which is still in use after forty-two years' service**

of the Laundry Department of the City of Bradford Co-operative Society, Ltd., has written to L.D.C. expressing the Society's appreciation of the performance of this alternator after forty-two years of service.

## Transformers for Northern Ireland

An urgent delivery of rural distribution transformers was recently made by the English Electric Co., Ltd., to meet the requirements of the Electricity Board of Northern Ireland. Three lorry loads of transformers left the company's Liverpool factory and were driven straight on board an ex tank-carrier, now used by Continental Services, Ltd., who took the lorries to Larne. From here they were driven directly to their destination and the empty lorries returned to Liverpool the following night. By this means the delays of special packing and



**English Electric rural distribution transformers en route from Liverpool to Larne in Northern Ireland**

trans-shipment were avoided. In this consignment there were 60 or 70 transformers, mainly 25 kVA, the rest being 15 kVA, representing sufficient capacity to supply 60 villages.

## Gloucester Television Relay System

The first television relay system to be operated in this country has been installed by Link Television, Ltd., in Gloucester, for use in conjunction with the sound relay system. One of the four audio-frequency channels carries the television sound signal and the other three give the Light, Home and Third programmes. The television signal is superimposed on the same four wires using carrier frequency. The receiving station is three miles outside Gloucester on high ground and the signal is conveyed to the distribution point over a centimetre-wave radio link. A metre-wave receiver also installed at this distribution point provides a check on the operation of the link and acts as a stand-by so that a service can be provided from it in the event of a failure of the link. In both cases the signal is received from Sutton Coldfield. Each subscriber has a television unit which includes the cathode-ray tube, scanning and e.h.t. circuits, and a video receiver designed for the carrier-frequency employed.

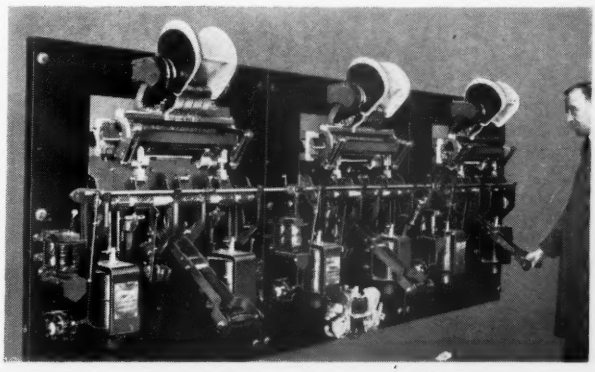
## Flow Production

A series of six lecture-discussions for senior industrial executives will be held at the College of Technology, Birmingham, on "Basic Principles of Flow Production," on Saturday mornings commencing 21st April. The course will be conducted by Mr. F. G. Woollard. Particulars may be obtained from the Department of Industrial Administration, College of Technology, Birmingham.

## Circuit Breaker for Holland

A 10,000 A triple-pole air circuit breaker for operation on a 500 V, three-phase, 50 c/s supply has recently been made by Salford Electrical Instruments, Ltd., for installation in a textile mill in Holland. The breaker is of the line-contact pattern and has a rupturing capacity of 70 MVA. Tripping is by means of shunt or series coils and reclosing is normally done remotely and electrically, but manual reclosing is possible in an emergency.

The three-phase units are linked by a common tripping rod to ensure simultaneous tripping. To guard against single-phasing, an interlock is provided whereby should one pole fail to close or open, a contact completes the tripping circuit of the other two poles. This interlocking is automatically made inoperative for manual reclosing and each pole can then be closed by hand without causing inter-tripping.



**10,000 A air circuit breaker made by Salford Electrical Instruments for a Dutch textile mill**

## Y.E.B. Building Inquiry

Following the promise of the Attorney-General to inquire into the alleged excessive spending of £39,000 on unlicensed building at Scarcroft Lodge, near Leeds, the headquarters of the Yorkshire Electricity Board, the West Riding police last week began their inquiries. It is expected that these will take a considerable time and a senior detective officer has been selected to conduct the investigation.

## Copper Export Restrictions

The President of the Board of Trade has announced that the rate of export of semi-manufactures of copper and copper alloys will be limited during the next three months (from 1st April) to approximately half the rate prevailing in the first six months of 1950. All applications will be considered on their merits and due weight will be given to "conversion value," to established pattern of trade, and to the importance of the end use. The export of semi-manufactures of zinc will be permitted only in exceptional circumstances.

## Electrical Journal's Jubilee

The April number of *Electrical Industries* marks that journal's achievement of its golden jubilee; it was founded in 1901 by Mr. Emile Garcke, whose name is familiar as a leading figure in the electricity supply and traction

world for many years. In its half century the paper has had only three editors, the late Mr. Adam Gowans Whyte, Mr. Wilfred L. Randell and Mr. S. M. Hills, the present editor. Lord Citrine and Mr. B. H. Leeson (B.E.A.M.A.) contribute congratulatory messages and the articles are largely reminiscent. These brief accounts of developments in many fields since 1901 are of absorbing interest and form a useful record.

## Meter Engineers' Dinner

A few tickets are still available for the annual dinner and entertainment to be held by the Southern Meter Engineers' Technical Group of the E.P.E.A. on 20th April at the Palmerston Restaurant, 49, Bishopsgate, London, E.C.2. Tickets (15s each) are obtainable from Mr. L. W. Russell, 26, Merrivale Avenue, Ilford, Essex.

## Electrical Trades Directory

In the 1951 edition of the "*Electrician* Blue Book" the sectionalization introduced in 1950 has been extended. The classified section is larger and there are new headings and subdivisions of previous headings; the trade names index has been doubled. Copies of this useful 1,258-page directory are obtainable from the publishers, Benn Bros., Ltd., 154, Fleet Street, London, E.C.4, or booksellers, at two guineas.

## Prices of Materials

In the accompanying table we give the prices of the more important materials used in the electrical industry. The figures are those quoted on Monday last.

| | |
|---|---|
| ALUMINIUM Ingots .. .. | ton £124 0s 0d |
| COPPER, H.C. Electro .. .. | ton £210 0s 0d |
| Fire Refined 99·7 per cent .. | ton £209 0s 0d |
| Fire Refined 99·2 per cent .. | ton £208 10s 0d |
| LEAD, English .. .. .. | ton £161 0s 0d |
| MERCURY .. .. .. .. | flask £31 15s 0d |
| TIN .. .. .. .. .. | ton £1,245 0s 0d |
| ZINC, G.O.B. Foreign .. .. | ton £160 0s 0d |
| Electrolytic .. .. .. | ton £164 0s 0d |
| BRASS Tubes .. .. .. | lb 1s 10½d |
| Sheet .. .. .. .. | lb 2s 2d |
| Wire .. .. .. .. | lb 2s 4½d |
| COPPER Tubes .. .. .. | lb 2s 0½d |
| Sheet .. .. .. .. | ton £260 0s 0d |
| H.C. wire and strip .. .. | ton £235 5s 0d |
| PHOSPHOR BRONZE | |
| Wire .. .. .. .. | lb 3s 5½d |
| RUBBER, No. 1 R.S.S. spot .. | lb 63¼d–64d |

## Changes of Name

British N.S.F. Co., Ltd., of Keighley, announces that in future the company will be known as N.S.F. Ltd. (National Switch Factory). This change is solely one of name and no alteration of any kind is contemplated in the firm's policy, constitution, directors or management. To meet the increased demand for its products an additional factory is now being built by the company on the Huyton Industrial Estate at Liverpool.

The New Insulation Co., Ltd., has changed its name to Permali, Ltd. The change involves no break of continuity or change of personnel. The company produces high density laminated wood products. To meet increasing demands for its products, the company is expanding its production facilities. An additional factory for the machining of componenst is already in full operation and this will be supplemented later this year by a new manufacturing plant.

## Sulphuric Acid Prices Raised

The Board of Trade has made an Order coming into effect on 9th April permitting increases in the maximum prices of sulphuric acid. The additions are 26s 6d per ton for weak acid and 33s 9d per ton for strong acid.

## Trade Announcements

The works of the **Colton Electrical Equipment Co., Ltd.**, are removing on 1st May to Cranham Hall Works, Moor Lane, Cranham, Upminster, Essex (telephone: Upminster 4454).

The final assembly and service departments of the **Bestfrend Electrical Co., Ltd.**, are being transferred to the company's new premises at Shrubland Works, Banstead, Surrey, to which all service inquiries and correspondence should be addressed after 14th April. Diceland Works will be replanned for the manufacture of small motors only.

The Norwich district office of the **Hotpoint Electric Appliance Co., Ltd.**, is removing on 9th April to 22, St. Benedict's Street, Norwich. The telephone number remains unchanged.

The premises occupied by the **British Thomson-Houston Co., Ltd.**, district office and Mazda trade counter at Swansea have been designated 12/13, The Kingsway (formerly 4/5, Northampton Gardens, Swansea). The telephone number remains unaltered.

---

## Information Department

THE extensive records of our Information Department enable us to reply to most queries, but occasionally we ask our readers' assistance in tracing names and addresses not known to us. We should be glad to have such information regarding the makers of the following:—

**"Burnett" switch fuses.**

General inquiries from readers relating to sources of electrical goods, makers' addresses, etc., are replied to by the Information Department through the post. Inquiries should be accompanied by a stamped addressed envelope.

# Non-Combustible Oils

*Their Merits as Electrical Insulators*

**From a Correspondent**

THE value of oil as a liquid insulating and cooling medium is widely recognized in the electrical industry. But mineral oils are a serious fire risk in many situations and circumstances, so endeavours are made to replace them by non-inflammable substances.

The most successful of the latter are the chlorinated benzenes, which were developed in the United States and have been used to a limited extent in England under different proprietary trade names. Until relatively recently these have been obtainable only from American sources, so purchasing difficulties in hard currency areas have minimized the uses to which they have been put. The availability of these insulating fluids from non-dollar sources is now changing the situation.

## Results of Blending

Most chlorinated benzene compounds are solid, or very highly viscous, and are thus unsuitable for such apparatus as transformers wherein a fluid is needed for insulation and to assist cooling. However, mixing produces an oily compound which is very similar in properties to normal mineral transformer oil. For example, a mixture of trichlorbenzene and chlorinated di-phenyl is a liquid with a lower freezing point than that of either constituent and a 40 to 60 per cent blend is suitable for use in normally designed electric transformers.

These substances can readily be produced to a high standard of purity, so that the properties of the final compound can be guaranteed to be within closely defined chemical and physical limits. When heated, they do not burn and will not support combustion ; even when decomposed by electric arcing within the liquid they do not give off inflammable vapours, but only non-explosive non-toxic gases.

When used as a substitute for normal transformer oil they have certain advantages over the natural mineral product:—

1.—The density is greater and the specific heat is similar to that of oil; therefore the cooling effect for a given volume is greater and this is an advantage, for the size of a transformer for a given rating may be reduced.

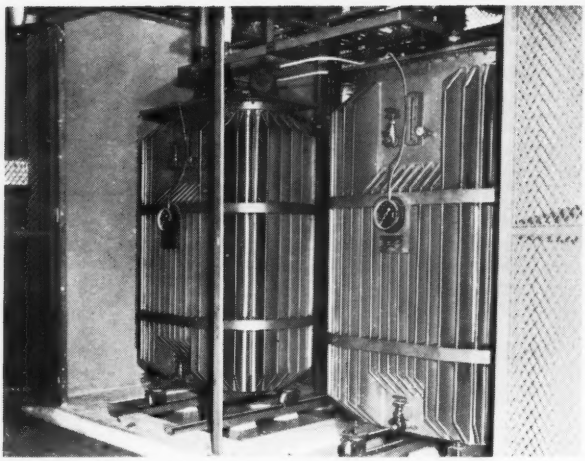
2.—The coefficient of expansion of the fluid is somewhat greater than that of a normal oil; therefore the rate of circulation due to convection is greater than with natural oils and so again the cooling is improved.

3.—The power factor of these synthetic oils is considerably better than that of the naturally occurring oils; thus gaps and clearances can, if necessary, be somewhat reduced.

The usual cause of electrical failure of normal transformer oils is the absorption of moisture, particularly when mineral oils are subjected to oxidation. The chlorinated compounds have much better properties in this respect, for the maximum quantity of water which may be dissolved in them does not exceed one in 10,000 parts. Further, the density of the synthetic oils is greater than that of water so that water tends to float on top of the oil and, providing the connections are made below the oil, there is no possibility of contamination of the electrical circuit by water. These materials are stable at all temperatures up to 400 or 500 deg F. They are chemically neutral and, not being subject to oxidation, do not change even when maintained for long periods at 200 deg F in air. These fluids do not affect the metals normally employed in the fabrication of electrical equipment, such as copper, aluminium, iron, brass or tin.

## Cost Comparison

The principal disadvantage is cost, which has been approximately six times that of oil bought on a weight basis. Prices have, however, more recently fallen by some 33 per cent to about 1s 10d per lb and, moreover, it should be borne in mind that because of the reduced requirements of the synthetic oils because of their better heat conducting and insulating properties



**Transformers in the basement of the Paris Opera are filled with non-inflammable synthetic oil**

this cost disadvantage can be frequently completely outweighed by the reduction of the quantities of oil and metals needed to construct an apparatus of given capacity.

The second disadvantage is that these liquids are solvents of some insulating materials, in particular of most natural resins, most non-polymerized synthetic resins, bitumens and rubber. Their solvent action on these materials is somewhat greater than that of normal oil, but they have no solvent or other disadvantageous effects upon cotton, paper, or viscose materials, nor upon the polymerized phenolic resins, such as "Bakelite." Among the materials which should not be used with chlorinated compounds are presspahn, micanite and insulating materials composed of, or held together by, normal varnishes, although varnishes of a formaldehyde phenolic resin basis are perfectly stable.

A third disadvantage is that the vapour pressure is somewhat greater than that of normal oils and therefore the loss by evaporation is proportionately greater; these synthetic oils should only be used in closed apparatus or apparatus fitted with conservator tanks exposing the minimum surface area to evaporation.

When an electric arc occurs in these oils decomposition occurs; the products are finely divided carbon and certain gaseous compounds, which consist predominantly of anhydrous hydrochloric acid, a small amount of oxygen, carbon dioxide, carbon monoxide and certain inert gases. The objectionable feature is the liberation of hydrochloric acid, which is a strong irritant of the respiratory organs, but it is not toxic and is readily detected. Where this gas would have adverse effects on the surroundings it is usual to incorporate a stable alkali, such as dry sodium carbonate, which will absorb the acid and liberate carbon dioxide. Some of the acid which may be generated in these circumstances may dissolve in the oil; while certain of the oils will resist a low concentration, it is desirable that oils which have been subjected to arcing should be reconditioned to eliminate the hydrochloric acid.

All mineral oils and their synthetic substitutes are to some extent harmful to the skin in that they frequently cause dermatitis or similar troubles. These particular chlorinated products, however, belong to groups of materials about which little is known of their effect on the human system. American reports on the subject indicate that the vapours may be toxic and that the absorption of the liquids or vapours through the skin may also injure human beings. While this danger is not important in normally constructed electrical plant in operation, it should be borne in mind and maintenance should be carried out in well ventilated buildings. Persons coming into contact with these oils should use barrier creams, or other effective skin dressing.

There are certain pieces of electrical apparatus which must be insulated by means of oils, such as transformers for X-ray equipment and probably in the future transformers for television cinema projectors. A defect in any of these cases would be most dangerous, not only because of the fire risk, but because of panic. For these purposes the chlorinated synthetic oils have outstanding advantages. Their cost is a small proportion of the total cost and the increase therefore can be ignored

while the advantage of non-inflammability is of supreme importance. The tendency with television equipment is towards higher voltages; even on the normal domestic set 30,000 V will be quite normal in the near future while for industrial and commercial equipment voltages will reach as high as 150 kV. The advantage in such cases of non-inflammable oils is considerable.

For flameproof electrical apparatus, too, they will considerably simplify the design problem, for the use of the normal transformer oils is undesirable because in the event of arcing taking place within the oil acetylene may be evolved and up to now no satisfactory flameproof standards have been established to deal with atmospheres in which this gas may be present.

The superior power factor of synthetic oils has already led to their considerable use as insulators for condensers, for they enable a much improved capacity condenser to be made for a given voltage in a given volume.

The illustration of two transformers which are part of the electrical equipment in the basement of the Opéra in Paris depicts a useful application of non-inflammable oil where electrical apparatus normally oil-cooled has to be used in a neighbourhood where fire and heavy smoke evolution might result in panic. The necessity for elaborate structural precautions can be minimized by the use of these oils and the transformers illustrated have been installed with this point in mind. The whole of the transformer equipment underneath the Opéra is filled with non-inflammable oil.

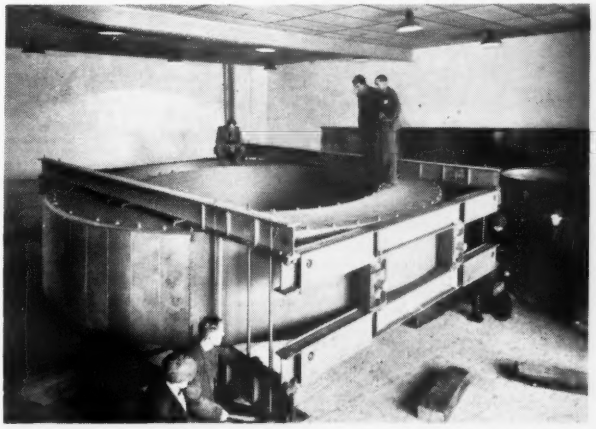
## LIVERPOOL SYNCHRO-CYCLOTRON

THE installation of the synchro-cyclotron at Liverpool University progressed further when the first of two large magnet coils was recently despatched from the Metropolitan-Vickers works at Trafford Park. This cylindrical coil is wound with a water-cooled aluminium conductor, weighs about 30 tons, and is 20ft in diameter. For the journey, it was encased in a steel girder frame weighing about 10 tons and because of the unusual dimensions and weight of the load on the road vehicle special traffic arrangements had to be made.

The synchro-cyclotron, which will be situated in the Nuclear Physics Laboratory of Liverpool University, is designed to accelerate protons to an energy of about 400 MeV. It will also deal with deuterons and other positively-charged particles, although the energy of these heavier particles will be proportionately reduced. In addition, it will make possible the study of artificially produced mesons.

The overall dimensions of the magnet are 32ft by 22ft by 13ft, and it weighs nearly 1,800 tons; the air gap is 156in in diameter and 14in long. The central magnetic field will be about 18,000 gauss. The total power of 840 kW will be supplied by a synchronous motor driven d.c. generator.

The cyclotron, which is expected to be completed in 1952, will be easily the largest in Europe and one of the largest in the world. The design and construction of the complete unit, which includes radio frequency equipment, water purification and de-gassing plant, and substation equipment, was undertaken by the Metropolitan-Vickers Electrical Co., Ltd.



**Installing the first magnet coil of the 400 MeV synchro-cyclotron in Liverpool University Nuclear Physics Laboratory**

# NEW BOOKS

**The Industrial Applications of Gas-filled Triodes (Thyratrons).** By R. C. Walker, B.Sc.(Lond.), A.M.I.Mech.E., A.M.I.E.E. Pp. 325; figs. and index. Chapman & Hall, Ltd., 37, Essex Street, London, W.C.2. Price 40s.

In recent years the use of electronic circuits for non-communication purposes has shown an extraordinary growth. One of the most useful circuit elements for these purposes is the thyratron, by reason mainly of the enormous ratio between the power in the anode circuit and the controlling power at the grid. Mr. Walker has prepared a survey of the use of thyratrons in industry which starts from a qualitative description of the processes operating inside the valve, continues with chapters on typical applications (basic circuits, switching, control and measurement, voltage and current regulation, commutating), and concludes with a chapter on miscellaneous devices including ignitrons, cold cathode valves, stabilovolts and strobotrons.

The literature dealing with these subjects is very diffuse and a good summary is clearly needed. It is doubtful whether Mr. Walker's book will fulfil this need. Throughout there is a reluctance to come to grips with quantitative considerations; for instance there are no characteristics of representative valves covering the range of ratings encountered in practice. The circuits discussed very rarely present values for the circuit components and, still worse, there is no concrete information on how the circuits should be proportioned. This book will be of more value to executives wanting to find out what can be done by electronic controls than to engineers who need to know how it is to be carried into effect. An adequate bibliography and references to original sources will remedy some of the deficiencies, but one is entitled to expect better than this.—A. H. B.

**Antenna Theory and Design, Vol. I. Foundations of Antenna Theory.** By H. Paul Williams. Pp. 142; figs. and index. Sir Isaac Pitman & Sons, Ltd., Kingsway, London, W.C.2. Price 21s.

In this volume the foundations of antenna theory are dealt with, the electrical design being considered in the much larger Volume II. The first three chapters are concerned with some aspects of vector theory, including the vector operations, followed by a review of electromagnetic formulæ, and culminating in the development of Maxwell's equations. Boundary conditions, and applications to the reflection of plane waves, are then considered. Chapter four deals with the retarded potentials and is applied to radiation from dipoles and some single wire aerials. The last chapter covers in somewhat greater detail the various methods of investigating radiation from cylindrical antennæ.

In general, the subject matter is well treated, though there are a number of errors and loose ends which may prove troublesome to a newcomer to the subject. The book suffers through being much too short. About half of it deals with the development of vector and electromagnetic theory, a matter that requires considerably more space than that allotted, and which is well covered by many available textbooks. It would have been much better if this space had been given directly to the development of aerial theory, so that the many important aspects such as Huygen's principle, and radiation from waveguides, horns, mirrors and lenses, all of which are untouched, could at least have received some attention. A number of important features, such as power gain, receive scant notice, and are not even listed in the appendix.

There is an urgent need for a good English textbook covering the wide field of antenna theory, and it would be well worth while to expand this little volume to the size of its companion in order to deal with the subject adequately.—L. L.

## Books Received

**Atomic Energy for the Layman.** By Sir Arthur L. Dixon. Pp. 221; figs. 19. Chantry Publications, Ltd., 63, Neal Street, Shaftesbury Avenue, London, W.C.2. Price 8s 6d.

**Electricity.** By L. E. C. Hughes. Pp. 123; figs. 9; index. W. & G. Foyle, Ltd., 119–125, Charing Cross Road, W.C.2. Price 2s 6d.

**Radar Simply Explained.** Second edition. By R. W. Hallows. Pp. 190; figs. and index. Chapman & Hall, Ltd. Price 10s 6d.

**Engineering Metrology.** By K. J. Hume. Pp. 293; figs. 123; bibliography and index. Macdonald & Co., Ltd., 72, Fleet Street, London, E.C.4. Price 18s.

# ELECTRICITY SUPPLY

## Perthshire Hydro-Electric Project

## East Midlands Load Spreading Suggestion

THE North of Scotland Hydro-Electric Board has published its Breadalbane Scheme (Constructional Scheme No. 25) which will utilize the water power resources of 186 square miles of Perthshire. It is in three sections (Killin, Luib and St. Fillans) and is estimated to cost over £15,000,000. With the Lawers Scheme (No. 18), on which work is to start shortly, it will be controlled from Killin. The eight stations of the group will have a capacity of 118,500 kW with an average estimated annual output of 384 million kWh.

The works to be constructed in the Killin section include three dams, the main one being across the River Lyon, and there will be generating stations at Lubreoch, Giorra and Lochay. The Luib section consists of collecting aqueducts and a small dam across the Monachyle Burn from which water will be led to Luib generating station 965ft below on the River Dochart. The St. Fillans section will involve the construction of a dam at the outlet of Lochan Breachlaich, the impounded water being taken by tunnel to Lednock generating station on the shores of a new loch to be formed by a dam across the River Lednock near Bovaine. From this loch, into which additional water will be diverted, a tunnel and pipeline will supply the St. Fillans generating station 830ft below on the shores of Loch Earn.

### *Western Argyll Scheme*

The Kilmelfort Scheme (Constructional Scheme No. 61) of the North of Scotland Hydro-Electric Board will add 9,000,000 kWh annually to the power available in Western Argyll, utilizing a catchment area of 11 square miles. A generating station which is to be built on the bank of the River Oude near its outlet into Loch Melfort will contain one 3,000 kW turbo-alternator operating under a gross head of 365 ft. Loch na Sreinge will be impounded by a small dam at its northern end and Loch Tralaig by a dam on the River Oude.

### *North of Scotland Tariff Increase*

Because of the rising cost of materials and labour the North of Scotland Hydro-Electric Board is to increase its charges for electricity by 10 per cent.

No consumer, however, will be charged a higher average price than the present maximum of 6d per kWh. The new prices will apply to electricity consumed from the date of the first meter reading after 31st March. The Board introduced new tariffs in December, 1948, which resulted in a reduction of charges in some areas and last winter a cheaper rate at ½d per kWh was introduced in the main part of the area.

### *South Australian Requirements*

To meet the growing demand for electricity in South Australia another major thermal generating station will be needed by 1958. This was stated by the Premier (Mr. T. Playford) during a visit to the Leigh Creek coalfield. He said that the plant would be additional to the extensions at Osborne and the new station being built at Port Augusta. A decision would be made within a year whether the proposed new station would be sited at Port Augusta and use Leigh Creek coal, or at Osborne and use "imported" fuel.

### *Local Committees and the Press*

The eleventh meeting of the East Midlands Electricity Consultative Council was held at Nottingham on 28th March. The chairman reported that in order to seek the advice and help of the Press in extending the relationship that the Council had already established with them, an informal meeting had been held with the editors of the daily papers in the Area. One of the main points made by the editors was that they should have early information of the activities of the Local Committees and the Council agreed that, as an experiment, a Press statement should be issued by the secretary after each Local Committee meeting to all daily and weekly papers within the area of the Committee concerned.

### *Staggered Hours*

The Number 3 (Leicestershire and Warwickshire) Local Committee of the East Midlands Consultative Council submitted a memorandum on the question of industrial load spreading by staggered working hours, which embodied proposals for the reduction of the industrial demand by 10 per cent during the periods 8 a.m. to 9.30 a.m. and 4 p.m. to 5.30 p.m. This scheme would necessitate industrial consumers in a Sub-Area or District being divided into ten groups each of equal

kilowatt loading. With ten working days in each fortnight, one group of consumers would be recommended to refrain from working each day during the peak load periods, and this would mean that each group would lose three hours' working time each fortnight. These three hours could be made up by working an extra twenty minutes on each of the other nine days. The Council suggested that the scheme should be forwarded to the National Advisory Committee for its consideration.

## *Representation Procedure*

A resolution passed by the Southern Electricity Consultative Council asks the Minister of Fuel and Power to give consideration to the amendment of Section 7 of the Electricity Act, 1947, in order to allow Councils to make direct representations to the Minister instead of through the Central Authority. During the discussion at a recent meeting of the Council the chairman mentioned that in the near future there would be a meeting of all Consultative Councils and he was hoping that the result might be a national body whose representations would perhaps bear more weight. Other members, however, were not convinced that a national body would be an advantage.

## *Welsh Water Power*

Sir Patrick Abercrombie told the Caernarvonshire Planning Committee on Monday that the proposed hydro-electric scheme for Snowdonia would be detrimental to the amenities of an area scheduled as a national park. Sir Patrick, explaining a report he had prepared as the Committee's consultant, said that during the 15–20 years needed to complete the scheme some cheaper or more effective way might become available of attaining the desired end. Although it might be nationally economic to-day to spend some £20–40 million to save one day's output of coal per annum, the new power station at Connah's Quay, Flints, should be a possible alternative. While the scheme would be detrimental to farming and water supplies, further investigation into the various uses of water and the amount available was necessary.

At a press conference after the meeting it was stated that the general feeling was that there could be no objection to making reasonable use of the water power provided this did not injure the amenities, and speakers did not dissociate themselves from the broader and more national point of view.

The Planning Committee's next step will be to consider the effects of the scheme on the county's water supplies.

## *More Trolley-Buses for Glasgow*

The question of whether trolley-bus services in Glasgow should be extended into the centre of the city was debated by Glasgow Corporation on 29th March when, by 53 votes to 50, approval was given to recommendations from the joint special sub-committee on tram and trolley-bus services. They included the provision of a new trolley-bus service between Clarkston and Garscube Road to be routed through the city via West Nile Street. Opposition was expressed by several members, and Councillor L. S. Blanche, transport convener, said that the running expenses per mile for both trams and motor-buses were higher than revenue per mile on the city services, whereas in the case of trolley-buses revenue was 25·030d per mile and running costs 18·723d per mile. One Councillor said that the disparity in mileage covered by trams and trolley-buses made the convener's figures rather meaningless.

## *Hunter-Hazell Cable Collection*

An exhibition illustrating the historical development of power cables from 1882 until the present time is to be held in the Display Centre of British Insulated Callender's Cables, Ltd., at 21, Bloomsbury Street, London, W.C.1, from 12th to 27th April. Known as "The Hunter-Hazell Cable Collection," it consists of 91 items and has been built up from sources not only in this country but in America, France, Germany, Italy and Switzerland. To-day, the collection is possibly the finest of its kind in the world, many of the cables being unique.

Among the most historically interesting samples are Edison two-core tubes, used in Holborn in 1882; components of the Crompton copper strip system, as used in 1886; a complete range of 10 kV mains of the 1890 period including Ferranti's own demonstration joint for his tubular mains; examples of the first 10 kV flexible paper-insulated cables in the world; the first oil-filled cable, made by L. Emanueli in 1920; and a large range of oil- and gas-pressure cables evolved during the last twenty years.

Admission will be by ticket obtainable from B.I. Callender's Cables, 21, Bloomsbury Street, W.C.1, or from any of the company's branch offices in this country. Applicants should specify a choice of two dates during the period in case one is fully booked. As a guide to the collection each visitor will be given a pictorial catalogue of the exhibits, which in itself is a document of historical interest.

## TRADE MARKS

APPLICATIONS have been made for the registration of the following trade marks. Objections must be entered by 21st April.

COLUMBIA. No. B687,618. Class 9. Broadcast television receivers and parts included in Class 9.—Columbia Gramophone Co., Ltd., Blyth Road, Hayes, Middx.

LEO. No. 695,083. Class 9. Electronic calculating apparatus and parts included in Class 9.—J. Lyons & Co., Ltd., Cadby Hall, London, W.14.

BASAC. No. 695,814. Class 9. Electrodes for electric welding.—Rockweld, Ltd., Commerce Way, Croydon.

VOLEX. No. 692,410. Class 11. Lampshades.—Ward & Goldstone, Ltd., Sampson Works, Frederick Road, Pendleton, Manchester, 6.

# FINANCIAL SECTION

## Company Notes and Stock Exchange Activities

### Reports and Dividends

**Ericsson Telephones, Ltd.**—Sir Harold Wernher (chairman), who presided at the annual meeting of the company on 30th March, referred to the fact that for the third consecutive year they had established new records both for output and profit. Once again a very large proportion of their sales had been to overseas customers. At home, the inadequacy of the Government's building programme for housing public exchanges was causing disquiet in the telephone industry because the position seemed to deteriorate; it was obvious that a higher building priority would have to be given to Post Office buildings. The export business had become more competitive and there might be some recession in profits in the immediate future, and raw material shortages might hinder production, but there was already sufficient evidence to justify the expectation that they would be able to present another satisfactory report next year.

**Mather & Platt, Ltd.**—Presiding at the annual meeting held on 29th March, Mr. L. E. Mather (chairman) said that this year they were making a jubilee grant of £50,000 to their employees to commemorate the origin of the business at the beginning of the nineteenth century; the early 1850's when the partnership of William and Colin Mather became the firm of Mather & Platt; and the turn of the century when Mather & Platt became a public company. Referring to the progress of the company, Mr. Mather said that during the year they had followed up new proposals in several of the departments of their business.

**Hilger & Watts, Ltd.**—Presiding at the annual meeting held on 19th March, Mr. G. A. Whipple (chairman and managing director) said that the demand for their products continued to be satisfactory, the most noteworthy feature being the increase in orders from the United States, which was now their third largest overseas customer. With regard to the establishment of companies in Canada and South Africa by Scientific Exports (Great Britain), Ltd., an export marketing company of which they were founder members, this development had resulted in expansion of Canadian business while there had been a substantial rise in orders from South Africa. During the year under review work in their research and development departments was intensified through the enlargement of facilities at Camden Town.

**British Industrial Plastics, Ltd.**—In the course of his speech at the annual meeting held on 29th March, Mr. K. M. Chance (chairman) said that during the past year production and sales of first-grade Beetle moulding powders were almost double those of 1946, sales of other grades of moulding powder increased substantially and of urea resins by 75 per cent. Group exports reached about £700,000 in value, and unless the defence programme intervened, he expected this figure to reach £1,000,000 during the current financial year. The total turnover of the group was about £2,750,000 during the period under review, and would reach £3,000,000 during the current period, which demonstrated the unreal basis of the capital structure of the company. The group had heavy capital commitments for the new factory they were now starting to equip, and in other directions they would need more working capital. The directors would therefore have to ask shareholders to provide additional capital, and an estimate of total requirements was now being prepared.

**Brook Motors, Ltd.**—The first stage of a reorganization of the capital structure of the company was carried out last year by the formation of a new company known as Brook Motors (Holdings), Ltd., which became the owner of all the issued capital of Brook Motors, Ltd. The second and final stage has now been completed by the winding up of the old Brook Motors, Ltd., and the transfer of all its assets to the new company which, in order to preserve continuity, has changed its name to Brook Motors, Ltd. This company, which has an issued and fully paid share capital of £625,654 and the same board of directors and management as the old company, will carry on without interruption the business of the old company and will be responsible for all existing contracts and obligations.

**Wolf Electric Tools (Holdings), Ltd.**—The registration of this company is recorded under "New Companies" in this issue. The company has been formed to acquire the whole of the issued share capital of Wolf Electric Tools, Ltd., the operating company. The company was incorporated as a private

company on 29th March with a capital of £100, and converted into a public company on 30th March, the capital being increased to £400,000. On Monday last particulars of the new company were advertised in connection with the private placing of 5s ordinary shares and the introduction of 7 per cent cumulative preference £1 shares.

**Reliance-Clifton Cables and Industrial Products, Ltd.,** have declared a second interim dividend on the ordinary shares of 20 per cent, making 30 per cent for the year. The board states that it is not its present intention to recommend the payment of a final dividend. For the previous eight months dividends totalling $16\frac{2}{3}$ per cent were paid, equivalent to 25 per cent per annum. It is also recommended that a sum of £39,250 be capitalized from general reserve and applied in paying up in full at par, 39,250 of the unclassified preference shares to be issued as 5 per cent cumulative preference shares on the basis of one new share for each £4 ordinary stock held. These cumulative preference shares are to be converted into stock upon issue and to rank for a full half-year's dividend on 30th September next.

**Waygood-Otis, Ltd.,** reports a consolidated profit for 1950, including income from investments and after providing for depreciation, etc., of £446,457, as compared with £338,248 for 1949. Taxation absorbs £183,000, and property, plant and equipment replacement reserve receives £110,000. It is proposed to pay a final dividend of 15 per cent (same), making with the interim of 30 per cent (20 per cent), a total of 45 per cent, less tax for the year (against 35 per cent). The balance carried forward is £207,934 (against £114,412 brought in).

**The British Oxygen Co., Ltd.,** reports a group trading profit, after depreciation, of £3,013,364 for 1950, as compared with £2,297,398 for 1949, and after deducting £1,712,167 for taxation, there is a net profit of £1,301,197 (against £1,156,725). It is proposed to pay a final ordinary dividend of 12 per cent, making 20 per cent for the year (unchanged). The balance carried forward is £370,793 (against £200,463 brought in).

**The British Aluminium Co., Ltd.,** reports a group trading balance for 1950 of £2,089,259, as compared with £1,538,359 for the preceding year, which with other income makes £2,112,771. After providing £479,492 for depreciation, £720,547 for taxation, and meeting other charges, there is a net profit of £608,734 (against £551,203). The final dividend on the ordinary stock is 6 per cent, maintaining the distribution for the year at 10 per cent. less tax, and the balance carried forward is £806,849.

**A. C. Cossor, Ltd.,** announce that the profits for the year to 31st March last will be sufficient, after providing for taxation at the present rate, to recover the deficiency brought forward from previous years, and to provide for a payment of one year's arrears of dividend of the 6 per cent preference shares.

**Falk, Stadelmann & Co., Ltd.,** have declared an interim dividend of 10 per cent (unchanged).

## New Companies

**Wolf Electric Tools (Holdings), Ltd.**—Registered 29th March. Capital £100. To acquire the whole of the issued share capital of Wolf Electric Tools, Ltd.; and to carry on the business of electrical and mechanical engineers and contractors, etc. Solicitors: Clifford-Turner & Co., 11, Old Jewry, E.C.2. Regd. office: Pioneer Works, Hanger Lane, Ealing, W.5.

**R. M. Catterson-Smith, Ltd.**—Registered 31st March. Capital £5,000. To acquire the business of an electric furnace engineer now carried on by R. M. Catterson-Smith at Adams Bridge Works, Wembley, as R. M. Catterson-Smith. Directors: R. M. Catterson-Smith and F. A. E. Walford. Regd. office: Adams Bridge Works, Exhibition Grounds, Wembley.

## Liquidation

**John Priestly, Ltd.,** wholesale distributors of electrical and radio apparatus, 164, High Street, Bordesley, Birmingham. Liquidator, Mr. E. H. Freeman, Daimler House, Paradise Street, Birmingham, appointed 20th March.

## Bankruptcies

**A. H. Smith,** electrical engineer, lately carrying on business at 62-64 Lower Sloane Street, London, S.W.1.—Trustee, Mr. T. J. M. Macleod, 4 Bucklersbury, London, E.C.4, released 23rd February.

**A. M. Willmore,** electrical and radio engineer, 45, King Street, Brighton.—Proofs for dividend by 13th April to the trustee, Mr. E. C. Sherwood, 8, Old Steine, Brighton, 1, Official Receiver.

**S. W. Morley,** radio and electrical engineer, "Morleys," Bow Street, Rugeley.—Proofs for dividend by 13th April to the trustee, Mr. P. J. Snow, 17, Albion Street, Hanley, Stoke-on-Trent.

**S. G. Penrith,** electrical contractor, lately carrying on business at 5 and 14, Mount Pleasant, Barrow-in-Furness. — Application for discharge to be heard 11th April at the Magistrates' Court, Lawson Street, Barrow-in-Furness.

# STOCKS and SHARES

THE unexpectedly favourable revenue figures for the financial year to the end of March, brought about a sharp improvement in prices of British Government stocks and kindred securities. The returns fostered a growing impression that, after all, taxation may not be too harshly increased, but that possibly a new defence loan may be issued in order to raise the necessary money. Within the course of the next few days doubts will be resolved; and, in the meantime, Stock Exchange prices are firm with a rising tendency.

An interesting introduction to the Stock Exchange market at the end of this week is Wolf Electric Tools (Holdings) ordinary shares of 5s each, and 7 per cent preference shares of £1 each. The ordinary shares will probably start in the market on the basis of 6s.

## Shareholders and the Budget

Up to within a week of Budget day, industrial markets gave few symptoms of the nervousness which is apt, as a rule, to precede the event. On the average, prices are below the best levels reached about a month ago, when reinvestment activity on the part of dispossessed steel stockholders was at its height, but reactionary tendencies have been limited, and a number of electrical equipment and other industrial shares stand at, or about, the highest quotations recorded for three years or so. By general consent, some of these prices owe a good deal to the expectation of a moderate, but general, relaxation of dividend policies this year, after the example already given by English Electric, A.E.I., and a daily growing list of others.

## Market Tendencies

Results of the tendencies noted above are to be seen, for example, in the quotation of British Electricity 3½ per cents at a fraction over par. The stock stood about 105 at its best last year. First-class debentures hold their ground comparatively well: the new Enfield Cables 4 per cent stock, issued at 100 recently, is now 102½. Preference shares have suffered a perceptible decline in popularity; the placing of large lines of preference stock may possibly hang fire, at present, in a manner uncustomary for some months past. Investment in the first-class electrical preference shares can be undertaken now on a 4¼ per cent basis. G.E.C. 4¼ per cent preference, for instance, have fallen to a few pence below £1. English Electric 3¾ per cents are down to 16s 3d, and pay 4½ per cent on the money. Investors who do not object to a high premium in the price, can obtain rather over 5 per cent in such issues as Siemens 10 per cent preference at about 39s.

## Fixed Interest Stocks

Much of the popularity gained by ordinary shares, during the early part of this year, has been at the expense of securities paying a fixed rate of interest. This shift of emphasis would be explained logically by the inflationary considerations which have been heavily influencing investment policies for some time. Potentially at least, ordinary shares are held to offer capital better protection against the persistent fall in the value of money; and investors have become increasingly inclined to accept, in favour of their advantages, the speculative element which goes along even with the best of the ordinary class. Matters were not assisted, for the fixed-interest classes, by the disturbance and weakness resulting in the gilt-edged market from the issue last month of British Iron and Steel Stock to thousands of former steel stockholders to whom it made no appeal.

## Company News

A. C. Cossor issues reflected mild disappointment with the company's announcement that, as indicated by the preliminary figures, profits for the year just ended will be sufficient to balance the debit balance brought forward from previous years and to provide for the payment of one year's dividend arrears on the 6 per cent preference shares; these received their last payment three years ago. Initial market reactions brought back the price of the 5s ordinary shares to 12s, and of the preference to 21s. Both British Oxygen and British Aluminium did what was expected of them in maintaining last year's rates of dividend on capital increased during the year by substantial new issues. The profit figures were also in line with anticipations, so that the shares concerned were not affected materially by the announcements. Thorn Electrical Industries are quoted ex rights, the old shares at 9s 3d middle and the new, being transferable free of stamp and fee, at about 3d higher.

## Decca Prospects

Revival in the price of Decca 1s shares last week, to 18s 9d, was apparently a delayed reaction to the chairman's review of the situation at the company's twenty-first annual meeting. He was able to give an account of lively progress in most branches of the business, including the American subsidiaries, the navigator and radar departments, as well as in the radio, television and gramophone sections. With regard to the current year, the chairman expects to see improvements in the next results. The shares show a yield of 6 per cent on the 112½ per cent dividends which have been paid since the war.

# Electrical Investments

## *Past Month's Price Changes*

| Company | Dividend Pre-vious | Dividend Last | Middle Price Mar. 30 1951 | Month's Rise or Fall | Yield £ | Yield s. | Yield d. |
|---|---|---|---|---|---|---|---|
| *Overseas Electricity Companies* | | | | | | | |
| Atlas Elec. .. | 2½ | 3 | 18/- | — | 3 | 6 | 8 |
| Calcutta Elec. .. | 6† | 6† | 22/6 | −1/- | 5 | 6 | 8† |
| Cawnpore Elec. .. | — | — | 28/9 | — | | Nil | |
| East African Power | 7 | 7 | 38/9 | — | 3 | 12 | 3 |
| Jerusalem Elec. .. | — | — | 12/- | −1/- | | Nil | |
| Madras Elec. .. | — | — | 31/3 | −1/8 | | Nil | |
| Nigerian Elec. .. | 10 | 10 | 30/9 | — | 6 | 10 | 1 |
| Palestine Elec. "A" | 5† | 5† | 21/6 | — | 4 | 13 | 0† |
| Perak Hydro-Elec. | Nil | Nil | 11/3 | −1/8 | | Nil | |
| Whitehall Inv. Pref. | 6 | 6 | 23/- | −6d | 5 | 4 | 4 |
| *Equipment and Manufacturing* | | | | | | | |
| Aberdare Cables(5/-) | 20 | 20 | 14/3 | — | 7 | 1 | 7 |
| Aron Elec. Ord. .. | 15 | 15 | 37/6 | −1/8 | 8 | 0 | 0 |
| Assoc. Elec. Ord. | 15 | 20 | 86/3 | −2/9 | 4 | 12 | 7 |
| Automatic Tel.& El. | 12½ | 12½ | 63/9 | +9d | 3 | 18 | 2 |
| Babcock & Wilcox | 15 | 15 | 69/6 | — | 4 | 6 | 2 |
| Baldwin, H. J.(2/-) | 25 | 25 | 5/9 | — | 8 | 14 | 0 |
| British Aluminium | 10 | 10 | 43/- | +1 - | 4 | 13 | 0 |
| B.I. Callender's .. | 6⅔ | 6⅔ | 35/6 | −6d | 3 | 15 | 1 |
| British Thermostat (5/-) .. .. | 25 | 30 | 31/3 | — | 4 | 16 | 0 |
| British Vac.Cleaner (5/-) .. .. | 20 | 20 | 13/- | +2/- | 7 | 13 | 10 |
| Brush Ord. (5/-) .. | 10 | 10 | 7/3 | +3d | 6 | 18 | 0 |
| Burco (5/-) .. | 35 | 42½ | 22/6 | −1/8 | 9 | 6 | 0 |
| Chloride El. Storage | 20 | 12½* | 63/3 | +9d | 3 | 3 | 0‡ |
| Cole, E. K. (5/-) .. | 20 | 20 | 19/6 | −6d | 5 | 2 | 7 |
| Cossor, A. C. (5/-) | Nil | Nil | 12/6 | — | | Nil | |
| Crabtree (10/-) .. | 17½ | 17½ | 39/- | — | 4 | 9 | 9 |
| Crompton Parkinson Ord. (5/-) .. | 22½ | 11¼* | 12/- | — | 4 | 13 | 9 |
| De La Rue (5/-) .. | 50 | 50 | 25/6 | −9d | 9 | 18 | 0 |
| Decca (1/-) .. | 112½ | 112½ | 18/9 | +1/9 | 6 | 0 | 0 |
| E.M.I. (10/-) .. | 8 | 8 | 20/- | — | 4 | 0 | 0 |
| Electrical Components (5/-) .. | 20 | 20 | 11/3 | — | 8 | 17 | 10 |
| Elec. Construction | 12½ | 15 | 66/3 | +2/3 | 4 | 10 | 4 |
| Enfield Cable Ord. | 7½ | 7½ | 33/- | −6d | 4 | 11 | 0 |
| English Electric .. | 10 | 15 | 62/6 | — | 4 | 16 | 0 |
| Ericsson Tel. (5/-) | 20† | 22†* | 46/3 | — | 2 | 7 | 7* |
| Ever Ready (5/-) .. | 40 | 35 | 31/3 | +1/8 | 5 | 12 | 0 |
| Falk Stadelmann | 15 | 15 | 43/- | +1/9 | 6 | 19 | 6 |
| G.E.C. Ord. .. | 17½ | 17½ | 85/- | −1/8 | 4 | 2 | 4 |
| General Cables (5/-) | 38* | 30* | 17/6 | — | 6 | 11 | 6 |
| Greenwood & Batley | 15 | 15 | 51/3 | — | 5 | 17 | 0 |
| Hackbridge Cable (5/-) .. .. | — | 20 | 15/3 | +9d | 6 | 11 | 2 |
| HackbridgeHewittic (5/-) .. .. | 12½ | 15 | 16/- | — | 4 | 13 | 9 |
| Hall Tel. Acc. (10/-) | 10 | 10 | 17/- | +6d | 5 | 17 | 8 |
| Heatrae (2/-) .. | 12½ | 12½ | 4/- | — | 6 | 5 | 0 |
| Henleys (5/-) .. | 20 | 20 | 24/0 | −1/- | 4 | 3 | 4 |
| Hoover (5/-) .. | 45 | 30* | 27/9 | −6d | 5 | 7 | 2 |
| Intl. Combustion (5/-) .. .. | 21 | 20* | 19/6 | +9d | 5 | 3 | 0 |
| Johnson & Phillips | 15 | 15 | 65/6 | +6d | 4 | 11 | 6 |

| Company | Dividend Pre-vious | Dividend Last | Middle Price Mar. 30 1951 | Month's Rise or Fall | Yield £ | Yield s. | Yield d. |
|---|---|---|---|---|---|---|---|
| *Equipment and Manufacturing (continued)* | | | | | | | |
| Lancashire Dynamo | 22½ | 22½ | 100/- | −9d | 4 | 10 | 0 |
| Laurence,Scott(5/-) | 12½ | 12½ | 14/3 | — | 4 | 7 | 9 |
| London Elec. Wire | 10 | 10 | 48/9 | +6d | 4 | 2 | 0 |
| J. Lucas .. .. | 17½ | 6⅞* | 35/- | — | 3 | 16 | 4 |
| Mather & Platt .. | 11 | 10* | 45/- | +6d | 4 | 9 | 0 |
| Metal Industries .. | 10 | 10 | 40/6 | −4/- | 4 | 19 | 0 |
| Mid. Elec. Mfg. .. | 12½ | 15 | 60/- | +1/8 | 5 | 0 | 0 |
| Murex .. .. | 20 | 10* | 52/- | −1/- | 3 | 17 | 0 |
| Newman Ind. (2/-) | 17½ | 10 | 3/- | −3d | 6 | 13 | 4 |
| Oldham & Son (1/-) | 60 | 30* | 5/- | — | 6 | 0 | 0 |
| Parsons, C. A. .. | 12½ | 15 | 82/6 | +1/8 | 3 | 12 | 10 |
| Plessey (5/-) .. | 20 | 20 | 16/3 | −1/8 | 6 | 3 | 1 |
| Pye Deferred( 5/-) | 25 | 35 | 19/3 | −2/- | 9 | 2 | 0 |
| Radio & Tel. (2/-) | — | — | 10½d | — | | Nil | |
| Revo (10/-) .. | 27½ | 27½ | 44/6 | +1/8 | 6 | 2 | 0 |
| Reyrolle .. .. | 12½ | 15 | 76/3 | — | 3 | 18 | 9 |
| Scophony Baird(1/-) | — | — | 1/7½ | +1½d | | Nil | |
| Scot. Cable (4/-) .. | 30 | 30 | 24/- | +6d | 5 | 0 | 0 |
| Siemens Ord. .. | 7½ | 7½ | 35/- | −1/8 | 4 | 5 | 9 |
| Switchgear&Cowans (5/-) .. .. | 20 | 22½ | 16/3 | — | 7 | 0 | 0 |
| T.C.C. (10/-) .. | 15 | 15 | 35/- | +6d | 4 | 5 | 9 |
| T.C. & M. .. | 9* | 10* | 43/6 | +1/- | 4 | 12 | 0 |
| Telephone Mfg.(5/-) | 9 | 10 | 10/3 | — | 4 | 17 | 7 |
| Thorn Elec. (5/-) | 20 | 20 | 18/9 | — | 5 | 6 | 8 |
| Tube Investments | 25 | 25 | 6⅝ | — | 3 | 18 | 7 |
| Vactric (5/-) .. | Nil | Nil | 12/- | +2/- | | — | |
| Veritys (5/-) .. | 5 | 2½ | 3/9 | −3d | 3 | 6 | 8 |
| Walsall Conduits (4/-) .. .. | 70 | 70 | 56/3 | — | 4 | 19 | 6 |
| Ward & Goldstone (5/-) .. .. | 50 | 44* | 39/- | +1/6 | 5 | 2 | 7‡ |
| Watford (2/-) .. | 20 | 25 | 7/3 | +3d | 6 | 18 | 0 |
| Westinghouse Brake | 14 | 14 | 60/- | −1/8 | 4 | 13 | 4 |
| West, Allen (5/-) .. | 10 | 10* | 11/6 | — | 4 | 7 | 0 |
| *Transport and Communications* | | | | | | | |
| Anglo-Am. Tel.: Pref. .. .. | 5 13/20 | 5 13/20 | 85½ | −2 | 6 | 15 | 6 |
| Def. .. .. | — | — | 16 | −1 | | Nil | |
| Anglo-Portuguese | 8 | 8 | 25/- | — | 6 | 8 | 0 |
| Brit. Elec. Traction: Def. Ord. .. | 50 | 32½* | 515 | −10 | 4 | 7 | 3‡ |
| Cable & Wireless: Ord. .. .. | — | 6 | 112½ | — | 5 | 6 | 8 |
| 4% Loan .. | 4 | 6 | 100 | — | 4 | 0 | 0 |
| Calcutta Trams .. | 6† | 6† | 29/- | +6d | | — | |
| Cape Elec. Trams | 6 | 4 | 15/- | — | | — | |
| Globe Tel. & Tel. Ord. .. .. | — | — | 23/- | +6d | | — | |
| Great Northern Tel. (£10) .. .. | 7½ | 8 | 12⅜ | −½ | 6 | 5 | 0 |
| Inter. Tel. & Tel. | Nil | 15 cts | 33½ | +1½ | | — | |
| Marconi Marine .. | 7½ | 10 | 34/3 | +1/9 | 5 | 16 | 9 |
| Oriental Tel. Ord. | 16 | 16 | 43/9 | +1/8 | 7 | 6 | 2 |
| Telephone Props. | 6 | 7 | 24/6 | — | 5 | 14 | 3 |
| Tele. Rentals (5/-) | 10 | 10 | 11/- | — | 4 | 11 | 0 |

* After capital bonus.
† Dividends are paid free of Income Tax.
‡ Yield adjusted to capital bonus issue.

# RECENT INTRODUCTIONS

## NOTES ON NEW ELECTRICAL AND ALLIED PRODUCTS

### Fractional h.p. Motors

THE new "Gryphon" range of fractional h.p. motors introduced by BROOK MOTORS, LTD., Empress Works, Huddersfield, includes single-phase machines of from 0·166 to 0·5 h.p. (split phase or capacitor) and three-phase models of

**Brook "Gryphon" fractional h.p. motor**

from 0·125 to 1 h.p. They are housed in heavy gauge double steel shells with cast iron endshields. Detachable cast iron feet are fitted and a conduit entry is incorporated in the non-driving endshield. The range includes protected, totally enclosed flange types with or without feet, and resilient mounting models for refrigerator or similar applications.

### Fire Lighter

Domestic solid fuel fires and boilers can, it is claimed, be lighted in 15–20 minutes without wood, paper or matches by an electric fire lighter made by SARUM ELECTRIC, LTD., 68, Brown Street, Salisbury. The heating element is of stainless steel, shaped to allow insertion between firebars as little as ½in apart. The element is fitted into a steel stem, finished in stoved black wrinkle enamel, with a lignum vitae handle. The loading of 500 W causes the lighter to run at black heat until covered by the coal or coke. A test lighter has run on three times normal loading for a period of 300 hours without damage (equivalent to lighting over 1,000 fires) but it is pointed out that the appliance will suffer damage if left in a white-hot fire for any length of time. The appliance, which is guaranteed for six months, costs 42s 9d (plus P.T. in this country).

**Sarum electric fire lighter**

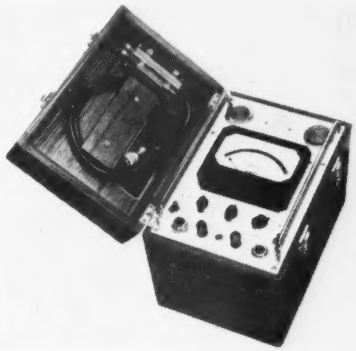
### Ice Cream Conservator

Special features of the new "Prestcold CC.82" ice cream conservator introduced by the PRESSED STEEL CO., LTD., Cowley, are the attractive streamlined cabinet finished in white synthetic enamel; insulated moulded rubber lids, with semi-soft sealing edges and integral non-breaking lifting arrangement; large capacity (10·3 cu ft); and the "Presmatic" hermetically sealed refrigeration unit (for a.c.). The overall dimensions are: 37¾in high, 48¾in wide, 29½in deep. The a.c. model costs £128 and the d.c. unit £133.

### Valve Voltmeter

A valve voltmeter for use on d.c. or 50 c/s to 150 Mc/s a.c. announced by the GENERAL ELECTRIC CO., LTD., Magnet House, Kingsway, London, W.C.2, is mains operated (230 or 115 V 50 c/s) and has ranges of 1·5, 5, 15, 50 and 150 V (r.m.s.) a.c. and d.c. The resistive component

**G.E.C. valve voltmeter**



of the input impedance is about 40 kΩ at 50 Mc/s and the input capacitance is of the order of 7 $\mu\mu$F. The accuracy is ± 2 per cent of full-scale deflection on all ranges for d.c. and on a.c. when the input is truly sinusoidal. The variation in indication for frequency changes between 50 c/s and 50 Mc/s is less than 1 per cent, or less than 5 per cent up to 100 Mc/s.

## Domestic Load Controller

Load controllers for incorporation in domestic installations to limit the demand during periods of system overload are announced by the ELECTRICAL APPARATUS CO., LTD., St. Albans, Herts. The controlling element may be voltage or frequency sensitive and when operative the consumer is limited to a pre-set current. The circuit is opened if this current is exceeded but by reducing his demand the consumer may obtain a continuous supply. Models are available for 10, 20 or 50 A normal current with any chosen value of reduced load. They are mounted in a standard watt-hour meter case and a pilot light may be fitted to show the consumer that reduced load conditions are in operation.

## Dairy Sterilizers

Three sizes of self-contained dairy sterilizers are now available from JAMES STOTT & CO. (ENGINEERS), LTD., Oldham. The DE1 has a capacity of 13 cu ft and raises approximately 17lb of steam an hour; it is loaded at 6 kW. The DE2 (25lb steam/hour, 9 kW) has a capacity of 22 cu ft; that of the DE3 (34lb steam/hour, 12 kW) is 35 cu ft.

Starting from cold, each model is capable of sterilizing a full load of bottles in 45 to 60 minutes (rather less for utensils, which do not constitute as heavy a load) and subsequent loads in approximately two-thirds of this time. With a churn steaming stool attachment churns can be sterilized in 2–3 min. A tap permits hot water to be drawn off for washing.

The galvanized steel sterilizing cabinet is enclosed in a casing constructed from mild steel sheets and sections and is adequately insulated to reduce heat losses to the minimum. A pressure relief valve is fitted, together with a thermometer. Three on/off rotary switches each control one-third of the total load.

## Luminous Call Indicators

Flashing type luminous call indicators for doctors' waiting rooms, offices, etc., are available from JULIUS SAX & CO., LTD., 24, Commerce Road, Brentford, Middlesex, in two main forms. One is a polished hardwood case containing a buzzer with the word "Enter" illuminated on the coinage bronze front plate. On pressing a button the buzzer sounds and the wording is illuminated by a light which flashes for 3 sec to 3 min (as ordered). A similar device, but with coloured indicator lamps and engraved labels, is also available. Both units operate from 12 V a.c.

## Large Household Refrigerator

The model "DMM-92" 9·2 cu ft household refrigerator brought out by FRIGIDAIRE, LTD., Stag Lane, London, N.W.9, differs from the "OMM-74" 7·4 cu ft model only in dimensions. The refrigerating system, which comprises a "Meter-Miser" unit, is basically the same but the capacities of both the evaporator and condenser have been increased. The refrigerant used is "Arcton-6," the British equivalent of "Freon-12." The total output of the new model is reserved for export during 1951.

*Below:* **Stott dairy sterilizer**
*Right:* **Frigidaire 9.2 cu ft domestic refrigerator**

# CONDITIONS IN TURKEY

## *Review of Market Prospects*

PROSPECTS for British export trade to Turkey are dealt with by Mr. T. G. A. Muntz, formerly Counsellor (Commercial) to H.M. Embassy at Ankara, in his report on the economic and commercial conditions in Turkey, published for the Board of Trade, Commercial Relations and Exports Department, by H.M. Stationery Office at 4s 6d net.

Mr. Muntz's report is dated April, 1950, and covers the years 1947–1949. He states that in the capital goods market United Kingdom tenders have been fairly successful and contracts have been secured in a variety of different lines, such as civil engineering, electric power supply, textile machinery, and telephone lines. Competition has often been severe and on some occasions German firms have quoted so far below United Kingdom firms as to leave the latter no chance. The reputation of British goods stands as high as ever, but the most serious threat to their strong position in the Turkish market would appear to be German competition. If German firms make satisfactory deliveries against the cut prices they have been offering they must inevitably capture a large part of the market in a number of lines.

Electrical imports for the years 1947–49 are shown in the accompanying table together with the figures of the principal importing countries.

Power production rose from 312 million kWh in 1938 to 676 million kWh in 1948, and is still quite inadequate for the needs of the country. The principal customers in 1948 were industrial consumers who accounted for 484 million kWh and domestic consumers with a total of 85 million kWh. As a result of the difficulties in maintaining equipment during the war and the cessation of expansion, there is a serious shortage of power in all parts of the country and in many places it is necessary to impose restrictions on the use of electricity during peak hours.

Development is continuing slowly and consists mainly of small extensions to industrial and municipal plants. The most important plant completed in 1948 was at Catalagzi with a capacity of 60,000 kW. This is at present far in excess of the needs of the district. It is therefore intended that the next step shall be to erect a h.v. line connecting Catalagzi with Istanbul and later through Izmit and Ankara. On this second line of an embryo grid there is to be a hydro-electric station at Sariyar, west of Ankara, with a capacity of 120,000 kW. It was decided only in 1949 to build this plant, and it cannot therefore be expected to be in production for at least four years, probably longer.

Plans are being made for hydro-electric projects in the Gediz valley which include a station of 70,000 kW capacity at Adala for supply to Izmir, and another at Tortum (15,000 kW) for supply to Erzurum.

| Class of Goods | 1947 | 1948 TL '000 | 1949 |
|---|---|---|---|
| Motors and dynamos | | | |
| *Total* | 4,019 | 8,733 | 8,178 |
| *From United Kingdom* | 1,112 | 1,936 | 2,904 |
| „ *United States* | 1,802 | 2,791 | 4,011 |
| „ *Switzerland* | 176 | 2,379 | 959 |
| Transformers, resistances, coils, etc. | | | |
| *Total* | 3,433 | 3,358 | 4,302 |
| *From United Kingdom* | 1,713 | 1,674 | 1,272 |
| „ *United States* | 1,151 | 1,117 | 1,849 |
| Commutators, convertors, switches, distributors, etc. | | | |
| *Total* | 1,418 | 3,400 | 3,215 |
| *From United Kingdom* | 302 | 1,592 | 790 |
| „ *United States* | 866 | 1,167 | 671 |
| Telegraph apparatus | | | |
| *Total* | — | 535 | 1,659 |
| *From United Kingdom* | — | 534 | 1,659 |
| Telephone apparatus | | | |
| *Total* | 2,907 | 8,483 | 1,754 |
| *From United Kingdom* | 171 | 657 | 832 |
| „ *Sweden* | 1,688 | 4,334 | 426 |
| „ *France* | 695 | 2,921 | 207 |
| Radio receivers and parts | | | |
| *Total* | 4,203 | 9,048 | 8,402 |
| *From Netherlands* | 1,765 | 2,765 | 2,759 |
| „ *United Kingdom* | 759 | 2,867 | 1,443 |
| „ *France* | 131 | 385 | 944 |
| „ *Sweden* | 422 | 399 | 988 |
| Electricity meters | | | |
| *Total* | 363 | 651 | 1,436 |
| *From Czechoslovakia* | 4 | 237 | 337 |
| „ *Hungary* | 36 | 209 | 287 |
| „ *Trizone* | — | — | 200 |
| „ *United Kingdom* | 15 | 28 | 64 |
| Armoured copper cable | | | |
| *Total* | 2,416 | 6,246 | 3,498 |
| *From United Kingdom* | 955 | 5,121 | 1,798 |
| „ *Italy* | 151 | 195 | 516 |
| „ *Trizone* | — | — | 373 |
| „ *United States* | 818 | 353 | 348 |

Goods manufactured from iron and steel, ranging from semi-finished castings, constructional iron, etc., to intricate machines, form by far the largest group of United Kingdom supplies, the total value in 1949 of TL 67½ million, accounting for well over a third of the total value of imports. During the years 1947–49 the United Kingdom steadily increased its sales of internal combustion engines, electric motors and dynamos, and other machinery.

# NEXT WEEK'S EVENTS

## Monday, 9th April

BIRMINGHAM.—Imperial Hotel, Temple Street, 6 p.m. I.E.E. South Midland Supply and Utilization Group. "Selection of Transformers for use in Distribution Networks, with special reference to the new Low Voltage Standard of 240 volts," by E. Tobin.

LIVERPOOL.—Royal Institution, Colquitt Street, 6.30 p.m. I.E.E. Mersey and North Wales Centre. Annual general meeting.

LONDON.—Savoy Place, W.C.2, 7 p.m. I.E.E. London Students' Section. "$CO_2$ Equipments," by D. W. Foster and W. E. M. Arundel.

NEWCASTLE-ON-TYNE.—Royal Station Hotel, 6.15 p.m. I.E.E. North-Eastern Centre. Annual general meeting, followed by a conversazione.

NORWICH.—Royal Hotel, 7.30 p.m. I.E.E. District meeting. "The Detection by Oscillographic Methods of Winding Failures during Impulse Tests on Transformers," by E. C. Rippon and G. H. Hickling.

## Tuesday, 10th April

BELFAST.—Queen's University, 6.45 p.m. I.E.E. Northern Ireland Centre. Informal lecture on "Modulation," by T. P. Allen.

BOLTON.—York Café, Great Moor Street, 7.15 p.m. A.S.E.E. Bolton Branch. "Distribution," by J. Yates.

LONDON.—85, Minories, E.C.3, 5.30 p.m. Institute of Marine Engineers. "The Electrical Machinery in a Cargo Liner," by J. B. Peacock.

MANCHESTER.—Engineers' Club, Albert Square, 6.15 p.m. I.E.E. North-Western Centre. "The London–Birmingham Television Radio-Relay Link," by R. J. Clayton, Dr. D. C. Espley, G. W. S. Griffiths and J. M. C. Pinkham.

## Wednesday, 11th April

ABERDEEN.—Caledonian Hotel, 7.30 p.m. I.E.E. North-East Scotland Sub-Centre. Annual general meeting.

BIRMINGHAM.—James Watt Institute, 6.30 p.m. I.E.E. South Midland Students' Section. Students' Lecture. "Switchgear," by L. Ducquer.

FARNBOROUGH.—R.A.E. Technical College, 7.30 p.m. I.E.E. Southern Centre. "The Electrical Properties of Nerve and Muscle," by Dr. W. E. Floyd.

LONDON.—Savoy Place, W.C.2, 5.30 p.m. I.E.E. Radio Section. "A V.H.F. Field-Strength Survey on 90 Mc/s," by H. L. Kirke, R. A. Rowden and G. I. Ross. "The Propagation of Metre Radio Waves beyond the Normal Horizon—Part I: Some Theoretical Considerations, with particular reference to Propagation over Land," by Dr. J. A. Saxton. "The Propagation of Metre Radio Waves beyond Normal Horizon—Part II: Experimental Investigations at Frequencies of 90 and 45 Mc/s," by Dr. J. A. Saxton, G. W. Luscombe and G. H. Bazzard.

TORQUAY.—Grand Hotel. Electrodepositors' Technical Society. Annual conference. (Continued until 14th April).

## Thursday, 12th April

DUNFERMLINE.—Unitas Hall, Queen Anne Street, 7 p.m. Dunfermline and District Electrical Society. "Rotating Machinery," by H. E. C. Clapham.

LEAMINGTON SPA.—Ashorne Hill. Institute of Physics, X-Ray Analysis Group. Spring Conference. (continued on 13th April).

LONDON.—Savoy Place, W.C.2, 5.30 p.m. I.E.E. Utilization Section. Lecture on "Modern Developments in Electric Welding," by Dr. H. G. Taylor.

At the School of Hygiene and Tropical Medicine, Keppel Street, W.C.1, 7 p.m. Institute of Industrial Administration. Annual general meeting, and "Does Management make the Best Use of the Facilities Available?" by Lord Verulam.

MANCHESTER.—College of Technology, Sackville Street, 6 p.m. I.E.S. Manchester Centre. Annual general meeting, followed by "Home Lighting," by J. N. Aldington. (Joint meeting with E.A.W.).

SOUTHAMPTON.—Guildhall, 6.30 p.m. I.E.E. Southern Centre. Faraday Lecture. "Lamps and Lighting—A Record of Industrial Research," by L. J. Davies.

SWANSEA.—Plaza Cinema, 6 p.m. I.E.E. West Wales (Swansea) Sub-Centre. "The Influence of Rectifier Harmonics in a Railway System on the Dielectric Stability of 33 kV Cables," by S. B. Warder, Dr. E. Friedlander and Dr. A. N. Arman.

## Friday, 13th April

BATH.—Technical College, 6 p.m. I.E.E. Western Centre District meeting. Discussion on "Metal Rectifiers," opened by D. Ashby.

CREWE.—Crewe Arms Hotel, 7.30 p.m. A.S.E.E. Crewe Branch. "Battery Vehicles," by R. D. Morgan.

LONDON.—Connaught Rooms, W.C.2, 12.30 for 1 p.m. British Electrical Development Association. Annual luncheon, followed by annual meeting.

Savoy Place, W.C.2, 6 p.m. I.E.E. Education Discussion Circle. Discussion on "The Presentation of Laboratory Experiments," opened by G. F. Freeman.

Connaught Rooms, W.C.2, 6 for 6.30 p.m. Association of Supervising Electrical Engineers. Annual dinner and reunion.

Storey's Gate, S.W.1, 5.30 p.m. Institution of Mechanical Engineers. "Steam Piping for High Pressures and High Temperatures," by Dr. R. W. Bailey.

NEWCASTLE-ON-TYNE.—King's College, 6.30 p.m. I.E.E. North Eastern Students' Section. Annual general meeting.

STAFFORD.—King Edward Grammar School, 7 p.m. I.E.E. North Staffordshire Sub-Centre. Report on "The Education and Training of Electrical Technicians," prepared by the Joint Committee on Practical Training in the Electrical Industry. Presented by K. R. Evans.

## Saturday, 14th April

LEEDS.—I.E.E. North Midland Students' Section. 2.30 p.m. Visit to Skelton Grange power station.

# MICA UNDERCUTTERS

Thousands of
**"JIFF-V"**
Undercutters
in use all over
the world.

Mica Undercutting by the use of files (and "sweat") has always been regarded as a method productive of satisfactory results.

The Universal Motor driven

## "JIFF-V"

Undercutter gives a similar clean "V" slot in a "Jiffy," and eliminates the hard and tedious work.

The high speed file is easy to guide, and permits cutting clear up to the commutator risers.

Can be used on commutators of all sizes above 4" diameter, without removing the Brush Arms.

**MARTINDALE ELECTRIC CO. LTD., 4 WESTMORLAND RD., LONDON, N.W.9**

**See full range of Martindale Equipment at B.I.F. Birmingham, Stand No. C 734**

EGA

A NEW *Plug-in* STARTER

## EGA *PLUG-IN* CONTROL GEAR

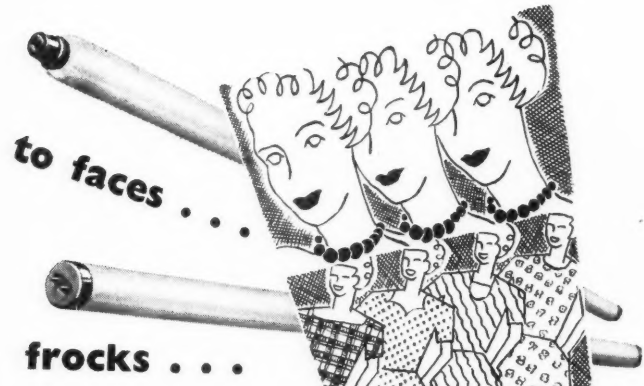
- Reduces maintenance problems.
- Starter, Isolator and Fuses are mounted on removable cover.
- All wiring is carried in the safety isolator socket fitted to the case back.
- Cover, complete with unit, can be replaced in a few seconds.
- Mains and motor leads are not disconnected when servicing.
- Starter and Isolator electrically interlocked.
- All models are the same height and depth, ensuring uniformity. This is of especial importance in connection with panel mounting.

*Illustration : Plug-in Reversing Starter*

**EGA ELECTRIC LTD**

**WEDNESBURY • STAFFS**

Choose lighting that is flattering . . .




METROVICK

MELLOW

*Fluorescent Lighting*

METROPOLITAN-VICKERS ELECTRICAL CO. LTD., ST. PAUL'S CORNER, 1-3 ST. PAUL'S CHURCHYARD, LONDON E.C.4

*Member of the A.E.I. group of companies*

# NEW PATENTS

## Electrical Specifications Recently Published

*The numbers under which the specifications will be printed and abridged are given in parentheses. Copies of any specification (2s each) may be obtained from the Patent Office, 25, Southampton Buildings, London, W.C.2.*

**1945**

4813. Philips Lamps, Ltd., Slade, C. E., and Yorston, J. —Electric switches and electric welding arrangements incorporating such switches. 21st April, 1947. (653371.)

13274. Marconi's Wireless Telegraph Co., Ltd.—Circuits for the detection of angle-modulated carrier waves and cathode-ray tubes for use therewith. 28th May, 1945. (653372.)

**1946**

14841. British Thomson-Houston Co., Ltd. (General Electric Co.).—Sighting mechanism for guns and the like. 16th May, 1946. (653610.)

26233. Marconi's Wireless Telegraph Co., Ltd.—Radio relay or repeater systems for the retransmission of image signals. 30th August, 1946. (653376.)

31934. British Thomson-Houston Co., Ltd. (General Electric Co.).—Antennae. 28th October, 1946. (653314.)

33436. Bush Radio, Ltd., and Wright, K. M. B.—Interference limiting arrangements for television receivers and like apparatus. 11th November, 1947. (653381.)

**1947**

3459. Aktiebolaget Svenska Elektronror, and Bergo-Heineman, A. M.—Method of removing surface contaminants from metallic contact pins of bases for electric lamps, electric discharge tubes, radio tubes, and the like, and of forming thereon a surface layer of good electrical conducting properties. 5th February, 1947. (653383.)

3696. Melin, F. L.—Light-sensitive steering and direction-finding devices. 7th February, 1947. (653431.)

6342. Naamlooze Vennootschap Philips' Gloeilampenfabrieken.—Tunnel furnaces having an endless transport belt. 6th March, 1947. (653432.)

13267. M-O Valve Co., Ltd., and Warren, G. W.—Electric discharge devices. 27th April, 1948. (653388.)

13946. Marconi's Wireless Telegraph Co., Ltd., and Shipway, R. P.—Gated amplifiers. 7th January, 1948. (653505.)

19298. Igranic Electric Co., Ltd.—Electric multi-pole switches. 18th July, 1947. (643509.)

19669. Bendix Aviation Corporation. Cable supports in electrical apparatus. 22nd July, 1947. (653510.)

21109. Lehmann, F.—Electro-magnetic apparatus. 1st August, 1947. (Convention date not granted.) (653437.)

21666. Marconi's Wireless Telegraph Co., Ltd.—Electron discharge tubes. 7th August, 1947. (653315.)

29063. Ibbotson, H.—Amplifying circuits embodying valves employing secondary electron emission. 9th October, 1948. (653398.)

31623. Pye, Ltd., and Weighton, D.—Radio guiding systems, particularly for aircraft. 26th November, 1948. (653440.)

32361. A. B. Du Mont Laboratories, Inc.—Television systems. 8th December, 1947. (653441.)

32874. Paatero, Y. V.—Chair for the X-ray examination of teeth. 12th December, 1947. (653401.)

33013. British Thomson-Houston Co., Ltd.—Electric discharge lamps. 15th December, 1947. (653442.)

33669. British Thomson-Houston Co., Ltd.—Control systems for direct current generator motor sets. 19th December, 1947. (653444.)

34197. Dubilier Condenser Co. (1925), Ltd., and Coursey, P. R.—Electrical network coupling units. 24th December, 1948. (653402.)

33969. Standard Telephones & Cables, Ltd.—Automatic telephone systems. 23rd December, 1947. (653524.)

34849. Aktieselskabet Kvaerner Brug.—Rotary drum electric driving gears for whale boilers or the like. 30th December, 1947. (653404.)

35056. Briza, J.—Directional antenna. 31st December, 1947. (653405.)

35057. Briza, J.—Arrangement for radio direction-finding. 31st December, 1947. (653406.)

**1948**

1457. R. G. Letourneau, Inc.—Induction motor rotor 16th January, 1948. (653528.)

4155. British Thomson-Houston Co., Ltd.—Method for providing diffuzing coatings. 12th February, 1948. (653323.)

4638. M-O Valve Co., Ltd., Freeman, G. V. H., and Windsor, L. R. E.—Electron discharge devices. 19th January, 1949. (653324.)

5328. Beach, R.—Elimination of static electricity. 23rd February, 1948. (653326.)

5950. Director of Office of Technical Services, Department of Commerce.—Radio locating systems. 27th February, 1948. (653330.)

5967. Director of Office of Technical Services, Department of Commerce.—Crystal mixer. 27th February, 1948. (653331.)

6587. Hotpoint Electric Appliance Co., Ltd., and Pocklington, K.—Ironing machines. 11th February, 1949. (653333.)

7076. Bata, Narodni Podnik.—Electro-magnetic clutches. 8th March, 1948. (653334.)

8244. British Iron & Steel Research Association, Carlisle, S. S., and Smith, B. O.—Electrical apparatus for the measurement of mechanical forces. 19th April, 1949. (653536.)

11275. General Electric Co., Ltd., and Sowter, A. B.—Methods of and apparatus for cold welding of metal. 1st April, 1949. (653339.)

11280. Martin, C.—Electronic musical instrument. 23rd April, 1948. (653340.)

11658. Radio Corporation of America.—Recording and monitoring optical unit. 28th April, 1948. (653342.)

11863. Klasek, V.—Pressurized electric switches, particularly of the liquid contact type. 30th April, 1948. (653343.)

12603. Standard Telephones & Cables, Ltd., and Wright, E. P. G.—Telecommunication exchange systems. 6th May, 1949. (653411.)

13029. Moravian Electrical Engineering Works, National Corporation, and Klima, V.—Construction of rotors for electric induction motors. 12th May, 1948. (653567.)

13661. Trott, F. R.—Fading circuits for controlling the transference of electrical signals. 7th May, 1949. (653537.)

13882. Pavelka, F.—Apparatus for the electrical purification of water. 21st May, 1948. (653350.)

15430. International Electrolytic Plant Co., Ltd., Wood, W., and Bowen, C. E.—Current distribution in mercury cathode electrolytic cells. 26th May, 1949. (653354.)

16368. Sylvania Electric Products, Inc.—Luminescent material. 17th June, 1948. (653576.)

15650. Watford Electric & Manufacturing Co., Ltd., and Craven, R. A. F.—Protective devices for electric circuits. 9th June, 1949. (653355.)

16603. Patelhold Patentverwertungs- & Elektro-Holding Akt.-Ges.—Directional beam aerial system with periodically varying radiation pattern. 21st June, 1948. (653464.)

16755. International Electrolytic Plant Co., Ltd., Wood, W., and Bowen, C. E.—Sectional electrolytic cells of the diaphragm type. 26th May, 1949. (653465.)

18150. Burndept, Ltd., and Wale, E. F.—Generation of high-voltage for the cathode-ray tubes of television receivers. 20th July, 1949. (653466.)

18412. Metropolitan-Vickers Electrical Co., Ltd., Stuart-Williams, R., and Shand, G.—Radar systems. 25th March, 1949. (653577.)

18521. Dehn, S. G. (Sunbeam Corporation).—Convection heater. 9th July, 1948. (653578.)

19530. Igranic Electric Co., Ltd.—Lifting magnets. 21st July, 1948. (653471.)

21479. Carter, R. H. A.—Electrical pulse storage or delay systems. 27th July, 1949. (653502.)

21928. Marconi's Wireless Telegraph Co., Ltd., Bedford, L. H., and Whitaker, L. W.—Television receiver synchronizing circuits. 4th August, 1949. (653413.)

22202. Bendix Aviation Corporation.—Overvoltage protector. 23rd August, 1948. (653584.)

22683. British Thomson-Houston Co., Ltd.—Dynamo-electric machines. 27th August, 1948. (653415.)

23512. Noyes, R. C. (S. C. Johnson & Son, Inc.).—Rotary floor polishing machine having a horizontally positioned electric motor. 7th September, 1948. (653417.)

24828. Dehn, S. G. (Gilfillan Bros., Inc.).—Two-co-ordinate radar system. 22nd September, 1948. (653484.)

23719. Philips Electrical, Ltd.—Snap-action electric switches. 9th September, 1948. (653482.)

25621. Philips Electrical, Ltd.—Devices for arresting a shaft by any one of a number of pawls arranged around the shaft. 1st October, 1948. (653419.)

26738. Crossland, Ltd., R. & A. G., and Cocksedge, F. M.—Screens or reflectors for tubular electric lamps. 2nd September, 1949. (653486.)

27313. Sylvania Electric Products, Inc.—Electric gaseous discharge devices. 20th October, 1948. (653421.)

27676. Philips Electrical, Ltd.—Electric discharge tubes. 25th October, 1948. (653592.)

27725. New Day Electrical Accessories, Ltd., and Davey, L. E. W. C. N.—Rotary electric switches. 4th October, 1949. (653545.)

28734. Tesla National Corporation, and Vackar, J.—Feedback arrangements in symmetrical cathode-follower circuits. 4th November, 1948. (653548.)

28897. Automatic Telephone & Electric Co., Ltd., Pearce, O. A., and Jones, E. W.—Telephone systems. 15th October, 1949. (653423.)

30005. Philips Electrical, Ltd.—Electrical coil formers. 18th November, 1948. (653596.)

30799. Stevens, A. H. (Robinson, J.).—Electric vaporizers. 26th November, 1948. (653598.)

32750. Caplin, F., and Barker, G. H.—Duplex radio communication systems. 28th November, 1949. (653605.)

33436. Abraham, G. A., and Russell, G. E.—Electric fencing. 29th December, 1949. (Cognate applications 9815, 11th April, 1949, and 22057, 24th August, 1949.) (653428.)

**1949**

85. British Thomson-Houston Co., Ltd.—Electric lamps. 3rd January, 1949. (653370.)

# AMERICAN ELECTRICAL EXPORTS

THE total value of exports of electrical machinery and apparatus from the United States in 1949 showed a small decline on 1948. Some classes—mainly the heavier equipment—increased, while others of the lighter kinds declined. The pattern was not, however, uniform. The total in 1949 was $470 million compared with $491 million in 1948.

Exports of steam turbo-generating sets showed an increase in value of 20 per cent in capacities over 500 kW but a decrease in the smaller units. Exports of diesel-electric generating sets, which were by far the largest item in the power-plant group, and totalled about 75 per cent more in value than the steam plant, stood only slightly below the 1948 figure. Both d.c. and a.c. generators showed an advance on the previous year, as also did power and distribution transformers and mercury arc rectifiers. In the trade in convertors there was a rise, notably in those of 300 kW and larger, exports of which more than doubled in value. Shipments of self-contained lighting units dropped in value by about 35 per cent while those of motors declined slightly in capacities from 1 to 200 h.p. but more than doubled in the higher powers.

Trade in several descriptions of domestic appliances receded, notably refrigerators (over 50 per cent), washing machines, flat irons (30 per cent) and cookers (50 per cent). A decline in the trade in filament lamps was only partly offset by better business (15 per cent) in the fluorescent type.

Canada and Brazil were outstanding markets for generating plant, with Venezuela a prominent buyer of diesel sets, and Mexico, other Latin-American countries, India and Turkey figuring also. France, Chile, Brazil, Mexico and Venezuela were noteworthy customers for transformers; and Canada, Belgium and France for rotary convertors. For the higher capacity motors France, Canada, Brazil, Belgium, Switzerland, Venezuela, Chile, Argentina and India were large buyers, as were Italy, Belgium, Cuba and Brazil for fluorescent lamps.

## Belfast Trolley-buses

BELFAST Corporation has applied to the Ministry of Commerce for the raising of a supplementary loan of £30,000 to meet increased expenditure for the extension of the trolley-bus services on the Holywood Road, Whitwell Road and Falls Road.

# CONTRACT INFORMATION

## Accepted Tenders and Prospective Electrical Work

### CONTRACTS OPEN

*Where "Contracts Open" are advertised in our "Official Notices" section, the date of the issue is given in parentheses.*

**Australia.**—BRISBANE.—13th June. State Electricity Commission of Queensland. Six 66,000V outdoor circuit breakers. (C.R.E. (I.B.) 56696/51. Ten/2249.)*

**Belfast.**—27th April. Electricity Department. 33 and 6.6 kV cables and accessories. (See this issue.)

**Burry Port (Carm.).**—18th April. U.D.C. Seven centrifugal sewage pumping units, all electrically operated and automatically controlled (Contract No. 5). A. P. I. Cotterell and Son, 54, Victoria Street, Westminster, S.W.1.

**Canada.**—TORONTO.—16th April. Toronto Transportation Commission. Supply of 106 ventilating louvres with single phase motors for the Yonge Street Subway. (C.R.E. (I.B.) 57248/51. Ten/2274/I.B.3.)*

**Edinburgh.**—North of Scotland Hydro-Electric Board. 33 kV, 11 kV and lower voltage distribution lines. (See this issue.)

**Glasgow.**—12th April. Corporation Lighting Department. Electrical fittings and accessories for one year from 1st June, 1951. Particulars from Lighting Department, 20, Trongate.

**Manchester.**—12th April. City Council. Electrical installation at police garage and transport headquarters, Longsight. City architect.

**Newcastle-on-Tyne.**—City Council. Electrical installations in 347 houses, flats and old people's dwellings and 20 shops and flats in course of erection on various housing estates. City architect, 18, Cloth Market.

**New Zealand.**—WELLINGTON.—12th June. State Hydro-Electric Department. Supply of 15 MVA 400 V switchgear. (C.R.E. (I.B.) 54954/51. Ten/2190.)*

**Persia.**—TEHRAN.—15th May. State Railways. 2,000 electric radiators. (C.R.E. (I.B.) 57078/51. Ten/2268/I.B.2.)*

**Romford.**—30th April. Engineer and Surveyor's Department. Electrical installations in 100 two-storey flats and 14 two-storey houses. (See this issue.)

**Seaton Valley (Northumberland).**—U.D.C. Electrical installations in 64 houses at Cramlington and Seghill. Surveyor, Council Offices, Seaton Delaval.

**Spalding.**—1st May. U.D.C. Sodium vapour and fluorescent lighting installation, trunk road A16. (See this issue.)

**Uruguay.** — MONTEVIDEO. — 27th April. Administracion Nacional de Combustible, Alcohol y Portland. Three 400 kVA, and six 75 kVA transformers. (C.R.E. (I.B.) 56821/51. Ten/2258.)*

**West Hartlepool.**—Town Council. Electrical installation in new Rift House County Primary School. Borough architect, Municipal Buildings.

### ORDERS PLACED

**Eccles.**—Housing Committee. Electrical installations in 26 houses and 22 bungalows being erected by J. Maunders & Sons, Ltd., on the Ellesmere Park estate (£1,468).—Arthur Wardle (Electrical Engineers), Ltd., Manchester.

**Grimsby.** — Corporation. Recommended. Electrical installation at Chelmsford Avenue Secondary Modern Girls' School £9,540).—N. G. Bailey & Co., Ltd.

**Houghton-le-Spring (Co. Durham).**—U.D.C. Electrical installation in connection with the conversion of a former rectory into offices (£673).—North of England Engineering and Electrical Co., Ferryhill.

**London.**—City of London Corporation. Electrical installation in flats at Police Dwellings, Ferndale Court (£7,125).—Thorpe & Thorpe, Ltd.

**Middlesbrough.**—Town Council. Heating and lighting installations at "Ashgate" (£297).—North Eastern Electricity Board.

**Newcastle-on-Tyne.** — City Council. Installation of electric lighting, etc., at St. Thomas' Church, Newcastle (£220).—Falconar, Cross & Co., Ltd.

### CONTRACTS IN PROSPECT

*Particulars of new works and building schemes for the use of electrical installation contractors and traders. Publication in this section is no guarantee that electrical work is definitely included. Alleged inaccuracies should be reported to the Editors.*

**Accrington.**—College of further education for Lancs C.C.; J. Gerrard & Son, Swinton, near Manchester.

**Anglesey.**—Nursery unit at Bronheulog Children's Home (£12,000); county architect, Llangefni.

**Ashford (Kent).**—Out-patients' department at General Hospital; South East Metropolitan Regional Hospital Board, 27, Queen Anne Street, W.1.

*Specifications may be inspected at the Commercial Relations and Exports Department, Board of Trade, Thames House North, Millbank, S.W.1 (Victoria 9040).

**Birkenhead.**—Central depot for repairs and maintenance (£22,000); B. Robinson, borough surveyor.

**Boston.**—Offices, London Road, for Holland C.C.; W. M. Smith, county architect, Boston, Lincs.

**Bridgend (Glam.).**—Conversions, including new 17-bedroom wing, Craig-y-Parcau, for hostel; county architect, County Hall, Cardiff.

Houses (80), West House site; U.D.C. surveyor.

**Brighton.**—Factory, Hollingbury industrial estate; Skelton, Sleat & Co., Ltd., 26, Raymouth Road, S.E.1.

Houses (48), Parkside estate extension; Rice & Son, Ltd., 23, Gloucester Place.

**Burnley.**—Stage 1 of Heasanford County Technical School; Kitson, Parish, Ledgard & Pyman, architects, Lloyds Bank Chambers, Vicar Lane, Leeds.

**Cambuslang.**—Houses (192) for Lanarkshire C.C.; Scottish Orlit Co., Ltd., builders, Paisley.

**Cheshunt.**—Flats (30), Carleton Road and Swanfield Road, for U.D.C.; Culpin & Son, architects, 3, Southampton Place, W.C.1.

**Cleator Moor.**—R.C. secondary school; Waddington & Broadbent, architects, 18, Scotch Street, Whitehaven.

**Ellesmere Port.**—Public hall (£100,000); C. W. Davis, surveyor, Council Offices.

**Felling (Co. Durham).**—Houses (50), Ellen Wilkinson estate; G. Wimpey and Co., Ltd., builders, Newcastle-on-Tyne.

**Harlow.**—Houses (148) and flats (16), Mark Hall South, for Development Corporation; Kirk & Kirk, Ltd., builders, Atlas Works, S.W.15.

**Hendon.**—Houses (118), Lawrence Street; borough engineer.

**Ilkeston.**—New hospital on site in Heanor Road for Sheffield Regional Hospital Board; E. F. Wilson, architect to the Board, Fulwood House, Old Fulwood Road, Sheffield.

**Leicester.**—Infants' school, Overdale Road; Symington, Prince & Pike, architects, 1, West Street, Leicester.

Concrete houses (100), Eyres Monsell estate; city architect, 7, Newarke Street.

**Lichfield.**—Bungalows (28), Burntwood; A. & J. Austin, Ltd.

**Luton.**—Additional factory premises; Geo. Kent, Ltd., Biscot Road.

**Manchester.**—Day nursery, Baguley area, Wythenshawe; city architect.

**Margate.**—Houses (60), Camborne Avenue; borough surveyor.

**Middlesbrough.**—County college for the E.C. (£160,000); education architect.

**Newcastle (Staffs).**—Houses (200), Clayton estate; C. B. Parkes, architect, Bourneville Estate Office, Birmingham.

**Northampton.**—Extensions to General Hospital; W. F. Howard, architect, 110, Old Brompton Road, London, S.W.7.

**Nottingham.**—Erection of Melbury Primary School; F. R. Freeman, Ltd., 13, Chapel Street, London, N.W.1.

**Oldbury.—Houses (72),** Titford estate, Rowley Regis; T. Dunkley Hogg, architect, 1, Church Street.

**Peterborough.**—Factory, Padholme Road; F. W. Wheatley, 34, Cavendish Street.

**Plymouth.**—Infants' school, St. Budeaux; Louis de Soissons & Partners, architects, 5, Portland Square.

**Redcar.**—Houses (70), Lakes estate; borough engineer, Town Hall.

**Redditch.**—Shops (20) and maisonnettes, Batchley estate; E. Buckley, U.D.C. surveyor, Council House.

**Sale.**—Further 70 houses at Baguley Lane estate; E. Bleakley, borough surveyor.

**Scarborough.**—Houses (36), Eastfield; M. Baum and Co., Ltd., builders, Middlesbrough.

Conversion of the Wessex Hotel into flats (£12,000); Wilkinson and Smith, architects, Martins Bank Chambers, Scarborough.

**Shoreham-by-Sea.**—Houses (48), Hammy Lane estate; U.D.C. surveyor, 31, John Street.

**Staffs.**—Combined child welfare centre and school clinic, Brierley Hill; county architect, Stafford.

**Stanley (Co. Durham).**—Conversion of New Kyo miners' hostel into housing accommodation (£18,360); G. L. Currie, builder, Balmoral Terrace, Newcastle-on-Tyne.

**Sunderland.**—Girls' grammar school, Thornhill Terrace; W. and T. R. Milburn, architects, 17, Fawcett Street.

**Sutton Coldfield.**—Scheme for three-storeyed flats on new estate at Falcon Lodge; T Porter, borough surveyor.

**Swansea.**—Houses (150), West Cross estate; borough architect.

**Warwickshire.**—Fire station for Warwick and Leamington; county architect, Warwick.

**Wellingborough.**—Houses at Croyland Hall estate for U.D.C.; Drabble Construction Co., Ltd., College Street, Rushton (50 houses) and Drury & Co., Ltd., 45, Second Avenue, Wellingborough (20 houses.)

**Welwyn Garden City.**—Factory, Bessemer Road (£150,000); Murphy Radio, Ltd., Welwyn.

**West Bromwich.**—Houses (94), garages, etc., Stanton Road; George Wimpey & Co., Ltd., builders, Chester Road, Castle Bromwich.

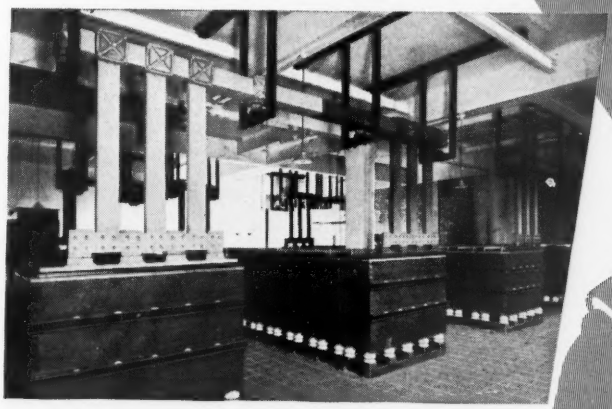
**West Hartlepool.**—Pathological department at General Hospital; Barrett and Sons, quantity surveyors, 127, New Bridge Street, Newcastle-on-Tyne.

**West Lancs.**—Houses (20), Cousin Lane site, Rufford, for R.D.C.; Ernest Abraham & Co., Station Road, Banks.

**Westmorland.**—Kendal-Kirkbarrow Infants' school; John Laing & Son, Ltd., Dalston Road.

**Wolverhampton.**—Maisonnettes (48), in eight blocks, Castlecroft; director of housing, Town Hall.

# P & G BATTERIES in the public service



These batteries in the Museum Telephone Exchange, London, are typical of many P & G batteries installed throughout the country to maintain telephone efficiency. Our 60 years' experience in the battery business covers a vast and varied field; including batteries for generating stations, railway electrification work and emergency lighting systems. P & G 3 point service working on the sound principle of two heads being better than one, exists to provide: **1.** *Detailed specifications or an impartial second opinion on any scheme.* **2.** *Complete equipment and installation.* **3.** *Regular inspection and report.*

**2** *heads are better than* **1**

**PRITCHETT & GOLD and EPS Co. Ltd**
50 GROSVENOR GARDENS · LONDON · SW1

P.G.17

*Batteries for Switch Closing, Switch Tripping, Emergency Lighting, Supervisory Control Telephones, Supply to Auxiliaries*

# MUTAC

## The *Silent* A.C. SWITCH

The original and universally popular silent switch for A.C. mains. The MUTAC range now consists of Surface, Semi-recessed and Flush types in 5 and 15-amp sizes and Ceiling mounting type in 5-amp size. Write for Publication S. 784 for full information.

**MUTAC** *Silent* A.C. SWITCHES *by* **G.E.C.**

*(Regd. Trade Mark)*

FOR USE ON A.C. ONLY

THE GENERAL ELECTRIC CO. LTD., MAGNET HOUSE, KINGSWAY, LONDON, W.C.2

# CLASSIFIED ADVERTISEMENTS

**ADVERTISEMENTS** are accepted up to **First Post on Monday** of the week of issue, and should be addressed to Classified Advertisement Department, Dorset House, Stamford Street, London, S.E.1.

**CLASSIFIED** advertisements are PREPAID at 3/- per line (approx. 7 words) per insertion. Where the advertisement includes a Box Number this counts as two words and there is an additional charge of 1/-.

**DISPLAYED**:—42/- per inch, per insertion. Cheques and Postal Orders should be crossed and made payable to ELECTRICAL REVIEW PUBLICATIONS LTD.

**SITUATIONS WANTED**:—Three insertions under this heading can be obtained for the price of two if ordered and prepaid with the first insertion.

**REPLIES** to Box Numbers should be addressed to the Box Number in the advertisement, c/o ELECTRICAL REVIEW, Dorset House, Stamford Street, London, S.E.1, but if not to be delivered to any particular firm or individual they should be accompanied by instructions to this effect, addressed to the Manager of the ELECTRICAL REVIEW. Replies in such cases cannot be returned. The name of an advertiser using a Box Number will not be disclosed.

**Original testimonials should not be sent with applications for employment**

## *OFFICIAL NOTICES, TENDERS, ETC.*

### CITY OF BELFAST

#### Electricity Department

#### Cables and Accessories

TENDERS are invited for the supply, delivery and installation of 33-kV and 6.6-kV Cables and Accessories.

Form of tender (No. N.1005), conditions and specification, in quadruplicate, may be obtained from Messrs. Merz & McLellan, Consulting Engineers, Carliol House, Newcastle-upon-Tyne, 1, on payment of a deposit of five guineas (cheques to be made payable to the Belfast Corporation Electricity Department), which deposit will be refunded provided a bona fide tender be lodged and not withdrawn. Extra copies of the contract documents may obtained at three guineas per set, which sum will not be returnable.

Each tender, in quadruplicate, in sealed envelope marked "Tender for 33-kV and 6.6-kV Cables and Accessories, Electricity Committee," and endorsed with the name and address of the tenderer, must reach the undersigned not later than 4 p.m. on Friday, 27th April, 1951.

An official receipt must be obtained for each tender delivered by hand. Tenders sent by post should be registered. The lowest or any tender will not necessarily be accepted.

JOHN DUNLOP,
Town Clerk.

City Hall, Belfast.
30th March, 1951. 1030

### NORTH OF SCOTLAND HYDRO-ELECTRIC BOARD

#### 33-kV, 11-kV and Lower Voltage Distribution Lines

TENDERS are invited for the supply, delivery and erection of approximately 13 miles of 33-kV and 5 miles of 11-kV and lower voltage single-circuit wood-pole overhead transmission and distribution lines in the Alexandria-Drymen-Kepculloch area, in the counties of Dumbarton and Stirling.

Copies of the tender document may be obtained on application to the Engineers, Messrs. Merz & McLellan, 39, Northumberland Street, Edinburgh, 3. Applications should be accompanied by a cheque for £1 1s., which will be refunded on receipt of a bona fide tender.

The Board do not bind themselves to accept the lowest or any tender.

W. D. D. FENTON,
Secretary.

16, Rothesay Terrace,
Edinburgh, 3.
21st March, 1951. 977

### SPALDING URBAN DISTRICT COUNCIL

#### Street Lighting

TENDERS are invited for supply and erection of Sodium Vapour and Fluorescent Street Lighting to Group A standard on Trunk Road A.16 in the Urban District of Spalding, which includes 61 140-watt Sodium Vapour and 23 3 × 80-watt Fluorescent Lamps.

Tenders are also invited for supply and erection of 21 3 × 80-watt Fluorescent Street Lamps to Group A standard on other roads in the town.

Applications for specifications, schedule and maps to be made to the undersigned and to be returned in sealed envelope endorsed "Tenders for Street Lighting" by noon on 1st May, 1951.

The Council do not bind themselves to accept the lowest or any tender.

RAYMOND W. HASTINGS,
Clerk to the Council.

11, Market Place,
Spalding, Lincs. 1029

### BOROUGH OF ROMFORD

#### Engineer and Surveyor's Department

THE Council invite tenders for the ELECTRICAL INSTALLATIONS to 100 Two-storey Flats and 14 Two-storey Houses on the Cross Road Housing Estate, Romford.

The specification and form of tender may be obtained from the Borough Engineer and Surveyor, Town Hall, Romford, on payment of £2 2s., which will be refunded on the receipt of a bona fide tender and all documents.

Sealed tenders endorsed "Electrical Installations (Cross Road, Part 1)" must be delivered to the undersigned not later than Monday, 30th April, 1951.

J. TWINN,
Town Clerk.

Town Hall, Romford,
March, 1951. 978

## *SITUATIONS VACANT*

### YORKSHIRE ELECTRICITY BOARD

APPLICATIONS are invited for the following appointments:—

#### No. 6 (Hull) Sub-Area

GENERAL ASSISTANT DISTRICT ENGINEER (Bridlington) (Vacancy No. 39/51). Applicants should have had experience in the operation and construction of 11-kV and L.T. overhead lines, including pole-mounted sub-stations for rural electrification. They should also be competent to carry out overhead line surveys, preparation of route plans, supervision of linesmen, and erection of overhead lines. Knowledge of underground networks will be an advantage. Preference will be given to Corporate Members of the Institution of Electrical Engineers or holders of the Higher National Certificate.

The successful candidate will be required to reside in Driffield.

Salary: N.J.B. Schedule, Class D, Grade 11, £436/£452 per annum.

SALES REPRESENTATIVE (Vacancy No. 40/51). Applicants should be conversant with a commercial organisation, and capable of carrying out small exhibitions, demonstrations and display of domestic and agricultural electrical apparatus by means of a mobile demonstration van, for which they would be responsible, and competent to give advice to consumers in respect of tariffs, etc.

Preference will be given to candidates who have served an electrical apprenticeship or who have taken a course in electrical salesmanship.

Salary: N.J.C. Grade 1, £310/£20/£390 per annum.

Applications, stating the above vacancy numbers and giving full details of age, qualifications and experience, should be forwarded to the Manager, No. 6 (Hull) Sub-Area, Yorkshire Electricity Board, Ferensway, Hull, within fourteen days of the appearance of this advertisement.

#### No. 7 (Grimsby) Sub-Area

ASSISTANT INSTALLATION ENGINEER (Gainsborough) (Vacancy No. 21/51). Applicants should have a good technical background and must have had practical experience in the supervision of domestic, agricultural and industrial installation work, including the preparation of estimates and tenders. Knowledge of radio and television and experience in the service associated therewith is also highly desirable.

Salary: N.J.B. Schedule, Class C, Grade 10, £438/£456 per annum.

Applications, stating the above vacancy number and giving full details of age, qualifications and experience, should be forwarded to the Manager, No. 7 (Grimsby) Sub-Area, Yorkshire Electricity Board, Moss Road, Grimsby, within fourteen days of the appearance of this advertisement. 1003

## BRITISH ELECTRICITY AUTHORITY

### Eastern Division

APPLICATIONS are invited for the following appointments at the new RYE HOUSE GENERATING STATION, near Hoddesdon, Hertfordshire. This station will have an ultimate capacity of 180 MW.

(A) MAINTENANCE ENGINEER (Mechanical).
(B) MAINTENANCE ENGINEER (Electrical).
Salaries Class G, Grade 6, £707-£737 p.a.
(C) CHEMIST.
(D) SHIFT CHARGE ENGINEERS.
Salaries Class G, Grade 7, £651-£679 p.a.
(E) BOILER HOUSE SHIFT CHARGE ENGINEERS.
Salary Class G, Grade 9, £571-£597 p.a.
(F) ASSISTANT ENGINEER (Operation & Efficiency).
Salary Class G, Grade 7, £651-£679 p.a.
(G) STATION SHIFT CONTROL ENGINEERS.
Salary Class G, Grade 10, £539-£561 p.a.
(H) JUNIOR ENGINEERS.
Salary Class G, Grade 16, £375 p.a. to Class G, Grade 14, £428 p.a.

for (A) Applicants should have had experience in the maintenance of mechanical plant, including turbo-alternators and boilers.

for (B) Experience in the maintenance of generating station electrical plant, including high-voltage switchgear.

for (C) Should possess a Degree in Chemistry and have had experience in the testing of fuels, oil and water.

for (D) Should have had experience in the operation of a station fired with pulverised fuel.

for (E) Experience in the operation of large pulverised fuel high-pressure boilers and associated equipment.

for (F) Experience in the efficient operation and testing of large boilers and turbo-alternators.

for (G) Experience in the operation of E.H.T. switchgear and load control of turbo-alternators.

The salaries for positions (C) and (F) are provisional and subject to negotiation through the medium of the appropriate negotiating body.

The appointments will be superannuable in accordance with the British Electricity Authority and Area Boards Superannuation Scheme.

Forms of application may be obtained from the Divisional Controller, British Electricity Authority, Eastern Division, Northmet House, Southgate, N.14, to whom completed forms should be sent to arrive not later than 20th April, 1951. Envelopes should be endorsed with the appointment sought.

W. N. C. CLINCH.
Controller.

Northmet House,
Southgate, N.14. 1007

## SOUTHERN ELECTRICITY BOARD

APPLICATIONS are invited for the following posts:—

ASSISTANT ENGINEER (Construction), Heston District of No. 1 (Southall) Sub-Area. Salary, N.J.B. Class E, Grade 10, Column 1 (£513 per annum, including London weighting) and N.J.B. conditions of service.

Duties will include assisting the Construction Engineer in the District in the installation and erection of plant, equipment, the laying of mains, indoor and outdoor sub-stations and other constructional work by direct labour and for control of urban distribution system up to and including 11 kV, including testing and commissioning.

Applications on forms obtainable from the Sub-Area Secretary, 2/6, Windmill Lane, Southall, and returned to him not later than fourteen days after the appearance of this notice.

ASSISTANT ENGINEER (Mains), Isle of Wight District of No. 3 (Portsmouth) Sub-Area. Provisional salary £450 per annum, subject to adjustment. Conditions of service as prescribed from time to time.

Candidates should have had experience in designing, construction, operation and maintenance of H.V. and L.V. overhead and underground distribution systems and sub-station plant, and should possess suitable technical qualifications.

Applications on forms obtainable from the Sub-Area Secretary, Lower Drayton Lane, Cosham, Portsmouth, and returned to him not later than fourteen days after the appearance of this notice, unless a form has already been submitted for the post, in which case a second application will not be necessary.

The successful candidates for the above appointments will be required to contribute to the B.E.A. and Area Boards Superannuation Scheme, if eligible.

F. W. KEMPTON,
Secretary. 930

## BRITISH ELECTRICITY AUTHORITY

### Chemists, Research Laboratories, Leatherhead, Chief Engineer's Department

APPLICATIONS are invited from CHEMISTS for appointments on the Scientific Staff of the Chief Engineer's Department in the Research Laboratories at Leatherhead. Candidates should possess a University Degree with First or Second Class Honours in Chemistry. Preference will be given to candidates with some research experience.

Duties will include testing, development and research work in the laboratories and in the field in connection with the generation, transmission and distribution of electricity.

Experience in the chemical engineering aspects of the combustion of coal is required for some of the appointments. One appointment will involve analytical work, and candidates should have experience in metallurgical analysis and modern physical methods.

The appointments, which are superannuable, will be made within the following grades of the National Joint Board Agreement, Schedule C (Headquarters) according to qualifications and experience: GENERAL ASSISTANT, Grade 5, £465-£594 p.a. rising to a maximum of £656 p.a.; THIRD ASSISTANT, Grade 4, £644-£769 p.a. rising to a maximum of £849 p.a.; SECOND ASSISTANT, Grade 3, £719-£969 p.a. rising to a maximum of £1,070 p.a.

These grading allocations are subject to confirmation by the National Joint Board.

Application forms may be obtained from the Secretary's Office (Establishments), Application Section, British Electricity Authority, British Electricity House, Great Portland Street, London, W.1, and should be completed and returned to D. Moffat, Director of Establishments, not later than 20th April, 1951.

Please quote Reference AE/148. 1031

## ADMIRALTY

VACANCIES exist at the Admiralty Engineering Laboratory, West Drayton, for DEVELOPMENT ASSISTANTS for experimental and development work in connection with electrical equipment of warships.

Candidates must be British subjects and should normally have served an engineering apprenticeship or have had equivalent workshop experience and possess the Higher National Certificate in Electrical Engineering or acceptable equivalent.

Experience in laboratory work will be an advantage for all posts, and a knowledge of applications of electronic and telecommunication techniques to engineering development will be an advantage for certain posts. Appointments will in first instance be on a temporary basis, but there will be an early opportunity to compete for established appointments.

Commencing salary will be assessed according to age, qualifications and experience within the range £470-£595 p.a. (minimum of range is linked to entry at age 30; deductions of approximately £20 being made for each year by which age on entry falls short of 30). Prospects exist of promotion to Senior Development Assistant grade (£595-£720 p.a.).

Applications, stating age, technical qualifications, apprenticeship and subsequent experience, should be addressed to Admiralty, C.E.H. Room 88, Empire Hotel, Bath. 1000

## CROWN AGENTS FOR THE COLONIES

CHARGEHAND (ELECTRICAL INSTRUMENT MAKER) required by the East African Railways and Harbours Administration for 40 to 48 months on probation with prospect of permanency. Commencing salary according to age in scale £520 rising to £610. Temporary allowance £90 a year. Free quarters. Superannuation fund. Outfit allowance £30. Free passages. Liberal leave on full salary.

Candidates, between 30 and 40 years of age, must have served a regular apprenticeship as an electrical instrument maker and have good subsequent experience. They should be fully conversant with the manufacture, repair, balancing, testing and calibration of electrical instruments, including switchboard pattern-portable; indicating and recording instruments; voltmeters, ammeters, wattmeters, moving iron, moving coil and dynamometer type; thermo couplers, temperature indicating and recording instruments, bridge meggers, etc.

Apply at once by letter, stating age, full names in block letters and full particulars of qualifications and experience, and mentioning this paper, to the Crown Agents for the Colonies, 4, Millbank, London, S.W.1, quoting M.28514B on both letter and envelope. The Crown Agents cannot undertake to acknowledge all applications and will communicate only with applicants selected for further consideration. 954

## ADMIRALTY

VACANCIES exist for ELECTRICAL and/or MECHANICAL ENGINEERING DRAUGHTSMEN in Admiralty Research and Development Establishments located in the vicinity of Weymouth, Portsmouth, Teddington (Middlesex) and Baldock (Herts).

Draughtsmen experienced in light current, electro-mechanical, precision mechanical and electronic equipment are particularly needed.

Candidates must be British subjects of 21 years of age and upwards, who have had practical workshop experience (preferably an apprenticeship) together with drawing office experience.

Appointments will be in an unestablished capacity, but opportunities may occur for qualified staff to compete for established posts.

The salaries offered, depending on age, experience, ability and place of duty, will be within the range £283-£510 p.a.

Exceptionally well qualified candidates may be considered for appointment in a higher grade within the salary range £470-£610 p.a.

Hostel accommodation is available at some establishments.

Applications, stating age and details of technical qualifications and apprenticeship (or equivalents) and workshop and drawing office experience, should be sent to Admiralty (C.E.II, Room 88), Empire Hotel, Bath. Original testimonials should not be forwarded with application. Candidates required for interview (at London or Bath whichever is nearest) will be advised within two weeks of application. 222

## CROWN AGENTS FOR THE COLONIES

ELECTRICAL ENGINEER (Electronic) required for the Headquarters staff at the London Office. Salary scale £750 a year rising to £1,000 a year. Extra duty allowance of 8% of annual salary also payable at present. Engagement will be on unestablished terms with a prospect, after satisfactory service and as vacancies occur, of appointment to the established and pensionable staff and promotion to a higher grade.

Candidates should preferably hold an honours degree in electrical engineering (telecommunications and electronics) or be corporate members of the Institution of Electrical Engineers. They should have served an apprenticeship with a firm of electrical engineers manufacturing radio or associated equipment and have had subsequent experience on the manufacturing and technical side of the industry.

The appointment will in the first instance be to the Inspection Department, and candidates should be capable of dealing with the problems arising from the inspection of a wide variety of electronic equipment by a staff of inspecting engineers.

Apply at once by letter, stating age, full names in block letters, and full particulars of qualifications and experience, and mentioning this paper, to the Crown Agents for the Colonies, 4, Millbank, London, S.W.1, quoting M.28544B on both letter and envelope. The Crown Agents cannot undertake to acknowledge all applications and will communicate only with applicants selected for further consideration. 1034

## BRITISH ELECTRICITY AUTHORITY

### Eastern Division

APPLICATIONS are invited for the following appointment: DEPUTY POWER STATION SUPERINTENDENT, Rye House Generating Station, near Hoddesdon, Hertfordshire. This station will have an ultimate capacity of 180 MW.

Salary in accordance with the N.J.B. Agreement, Grade 3, Class G (£885-£927 per annum).

Applicants should have had a good technical education, considerable practical experience in the operation, maintenance and administration of a large generating station, and should preferably be Corporate Members of one of the recognised Engineering Institutions.

The successful applicant will be expected to reside within a reasonable distance of the generating station.

The appointment will be superannuable in accordance with the British Electricity Authority and Area Boards Superannuation Scheme.

Forms of application may be obtained from the Divisional Controller, British Electricity Authority, Eastern Division, Northmet House, Southgate, N.14, to whom completed forms should be sent to arrive not later than 20th April, 1951. Envelopes should be endorsed "Deputy Power Station Superintendent, Rye House."

W. N. C. CLINCH,
Controller.
Northmet House,
Southgate, N.14. 1006

## ADMIRALTY

APPLICATIONS are invited for posts as TECHNICAL ASSISTANTS in Admiralty Establishments at home and abroad. Work involves investigating problems in connection with electro-mechanical devices (including electronics), mechanical assemblies and testing apparatus, therefore experience of workshop plant and equipment desirable. Ability to render clear and concise technical reports and to direct work from drawings and diagrams is necessary.

Candidates, who must be British-born subjects, should possess qualifications at least to Higher National Certificate (Electrical Engineer) or equivalent standard, or have had many years of the required practical experience. Appointment of a selected candidate will be on an unestablished basis. Initial training will be given followed by a probationary period in U.K. Candidates must be willing to serve wherever required at home or overseas, and will be required to be medically examined to ensure fitness for service overseas. Period of service abroad will not exceed three years.

Salary will be within the range £320-£545 (provincial) according to age, experience and qualifications. When serving overseas equivalent "London" rate of salary is payable, i.e., the provincial rate is increased by from £20 to £30 a year, plus foreign service allowance (not taxable). Free passage will be provided for wife and family when accommodation has been found.

Application forms from Ministry of Labour and National Service, Technical and Scientific Register (K), York House, Kingsway, London, W.C.2, quoting reference D61/51-A. Original testimonials should not be forwarded. 1001

## BRITISH ELECTRICITY AUTHORITY

### South Western Division

### Third Assistant Engineer (Mechanical), Generation Construction Department, Plymouth

APPLICATIONS are invited from suitably qualified candidates for appointment as THIRD ASSISTANT ENGINEER (Mechanical) in the Generation Construction Department at Plymouth.

Applicants should have had appropriate technical and works training, and should be familiar with site erection work, programming and progressing with contractors' site staff, and have general experience on modern power station mechanical equipment.

The general conditions of employment will be those negotiated by the National Joint Board, and the salary in accordance with Schedule C, Class AX/CX, Grade 5 (£579-£710/£738-£753 p.a.).

The appointment will be superannuable in accordance with the British Electricity Authority and Area Boards Superannuation Scheme.

Forms of application may be obtained from the Divisional Secretary, British Electricity Authority, South Western Division, British Electricity House, 26, Oakfield Road, Clifton, Bristol, 8, and should be returned to him not later than 21st April, 1951.

R. C. BARRETT,
Divisional Secretary.
29th March, 1951. 1005

## BRITISH ELECTRICITY AUTHORITY

### Yorkshire Division

APPLICATIONS are invited for appointments as MAINTENANCE ENGINEERS (Electrical) at the following power stations:—

Blackburn Meadows Power Station, Sheffield, Class II, Grade 6, £751-£783 per annum.

Neepsend Power Station, Sheffield, Class II, Grade 6, £751-£783 per annum.

Ferrybridge Power Station, Class II, Grade 6, £751-£783 per annum.

Applicants should have had a wide experience of power station electrical equipment and practical experience of E.H.T. switchgear and protective gear. Preference will be given to candidates who are Corporate Members of the Institution of Electrical Engineers or who hold equivalent qualifications.

The appointment will be subject to conditions of service in accordance with the N.J.B. Agreement, and will be superannuable under the Authority's Scheme.

Forms of application may be obtained from the Divisional Secretary, British Electricity Authority, Yorkshire Division, British Electricity House, St. Mary's Road, Leeds, 7, to whom completed forms should be returned within 14 days of the appearance of this advertisement. Envelopes to be endorsed "Maintenance Engineer (Electrical)."

G. A. VOWLES,
Divisional Controller. 955

## UNIVERSITY OF ST. ANDREWS

THE University Court of the University of St. Andrews invites applications for appointment as LECTURER IN ELECTRICAL ENGINEERING in the Department of Electrical Engineering, University College, Dundee. Candidates should possess a good Honours Degree, either in Electrical Engineering or in Mathematics and Physics, and preference will be given to those who have had suitable experience in research and teaching in radio and electronics.

The successful candidate will be expected to take a large measure of responsibility for (a) the equipping and organisation of the Electronics and Communications Laboratory in the new laboratories of the Department, which are now under construction; and (b) honours lectures in electronics and communications, in addition to sharing in the general work of the Department.

The commencing salary will be within the range £650 to £850 per annum, according to qualifications and experience, together with F.S.S.U. benefits. The University operates a scheme of family allowances, and a grant towards expenses of removal may be made.

The successful candidate will be expected to take up his duties about 1st September, 1951. Further particulars may be obtained from the undersigned, with whom one copy of the application, together with copies of testimonials and the names of three referees, should be lodged not later than 7th May, 1951.

DAVID J. B. RITCHIE,
The University, St. Andrews. Secretary.
27th March, 1951. 989

## CROWN AGENTS FOR THE COLONIES

ELECTRICAL AND MECHANICAL ENGINEER (M.28495B) required by the Nigerian Coal Corporation for two tours of not less than 15 nor more than 24 months in the first instance. Salary (including allowances) £1,505 a year. Gratuity on satisfactory completion of service, payable in accordance with regulations at the rate of £225 a year. Outfit allowance £30. Motor allowance (basic) £120 a year. Free passages. Liberal leave on full salary.

Candidates (aged 32 to 42 years) must be Associates of the Institution of Mining, Electrical and Mechanical Engineers, have had administrative experience, and have held a responsible position in the United Kingdom for not less than 3 years, comparable to that of Sub-Area Engineer in the National Coal Board.

Apply at once by letter, stating age, full names in block letters and full particulars of qualifications and experience, and mentioning this paper, to the Crown Agents for the Colonies, 4, Millbank, London, S.W.1, quoting M.28495B on both letter and envelope. The Crown Agents cannot undertake to acknowledge all applications and will communicate only with applicants selected for further consideration. 931

## MIDLANDS ELECTRICITY BOARD

### Central Gloucestershire Sub-Area

APPLICATIONS are invited for the appointment of TRANSPORT SUPERINTENDENT. The successful applicant will be responsible for the control and maintenance under the Sub-Area Engineer of a fleet of 190 vehicles, including a central repair depot. Applicants should have had experience in a similar capacity. Technical qualifications an advantage.

Salary and conditions in accordance with the National Joint Board, Grade G10, £539/£561 per annum, subject to negotiation.

Applications in writing, stating age, experience and qualifications, to D. Holt, Sub-Area Manager, Central Gloucestershire, Midlands Electricity Board, 126, London Road, Gloucester.

21st March, 1951. 957

## ADMIRALTY

DRAUGHTSMEN experienced in all Electrical Engineering techniques are required for temporary service in the Electrical Engineering Department, Admiralty, at Bath. Candidates must be British subjects of 21 years of age and upwards, who have had practical workshop experience (preferably an apprenticeship), together with drawing office experience.

Salary will be assessed according to age, qualifications and experience within the range £283-£495 per annum.

Applications, stating age and details of technical qualifications and apprenticeship (or equivalents) and workshop and drawing office experience, should be sent to Admiralty (C.E. II, Room 88), Empire Hotel, Bath, quoting "EED/DM." Candidates required for interview will be advised within two weeks of receipt of application. 1002

## BRITISH ELECTRICITY AUTHORITY

### East Midlands Division

APPLICATIONS are invited for the position of THIRD ASSISTANT ENGINEER (Civil) in the Generation (Construction) Department. The post will be located at the Northampton Power Station.

Applicants must be Chartered Civil Engineers or hold other equivalent qualifications and should be experienced in the design and supervision of civil engineering works.

Salary and conditions of service will be in accordance with Class AX/DX, Grade 5, of Schedule C, of the National Joint Board Agreement (£579-£776 per annum).

The post is superannuable within the provisions of the British Electricity Authority and Area Boards Superannuation Scheme.

Applications should be submitted on the official form, which may be obtained from the Divisional Establishments Officer, British Electricity Authority, East Midlands Division, Barker Gate, Nottingham, and should be returned not later than 17th April, 1951.

W. S. BURGE,
Divisional Controller. 888

## MIDLANDS ELECTRICITY BOARD

### North Staffordshire Sub-Area

APPLICATIONS are invited for the position of JUNIOR ENGINEER in the Construction Section at the Sub-Area Headquarters, 31, Kingsway, Stoke-on-Trent.

Applicants should have had experience in distribution work, particularly the maintenance and construction of high-voltage and low-voltage overhead and underground cables and sub-stations. The duties will include the preparation of schedules of working details. Appropriate technical qualifications will be considered an advantage.

Conditions of service will be in accordance with the National Joint Board Agreement and the salary will be in Class J, Grade 15, £435/£451 per annum.

Applications, stating age, present salary, qualifications and experience and present position, should be endorsed "Junior Engineer, Construction," and forwarded within fourteen days to H. A. P. Caddell, Sub-Area Manager, 31, Kingsway, Stoke-on-Trent.

A. STEPHENS,
Secretary. 956

## BRITISH ELECTRICITY AUTHORITY

### East Midlands Division

APPLICATIONS are invited for the position of GENERAL ASSISTANT ENGINEER (Construction) in the Generation Construction Department.

Applicants must hold the Higher National Certificate in Mechanical and/or Electrical Engineering, or be Corporate Members of the I.E.E. or I.Mech.E., and should preferably have had workshop training.

Salary and conditions of service will be in accordance with the National Joint Board Schedule, Class AX (8), commencing at £437 per annum.

The post is superannuable within the provisions of the British Electricity Authority and Area Boards Superannuation Scheme.

Forms of application, which may be obtained from the Divisional Establishments Officer, British Electricity Authority, British Electricity House, Barker Gate, Nottingham, should be returned not later than 12th of April, 1951.

W. S. BURGE,
Divisional Controller. 862

## EAST MIDLANDS ELECTRICITY BOARD

### Boston District

### Mains Foreman, Northern Section

APPLICATIONS are invited for the above position. Applicants should possess a good experience of the erection of lines up to 11 kV, the maintenance of lines up to 33 kV, and the control of construction gangs on overhead line construction and cable laying. Ability to drive a vehicle would be an advantage. Rates of pay and conditions of service to be governed by N.J.I.C. Agreement, the present rate being 3s. 4½d. per hour. A house will be available for the successful applicant at Spilsby, Lincolnshire.

Applications, stating age, full details of training and experience, should be forwarded to the District Manager, East Midlands Electricity Board, Besco House, Boston, Lincolnshire, not later than Saturday, April 14th, 1951. Envelopes should be endorsed "Foreman." 981

## NATIONAL COAL BOARD

APPLICATIONS are invited for the post of ASSISTANT POWER GENERATION ENGINEER in the Production Department at London Headquarters.

The duties of the post involve the preparation of schemes for pithead power stations using low-grade fuel, and investigations in connection with colliery power supplies generally.

Candidates should be Corporate Members of the Institution of Electrical Engineers or the Institution of Mechanical Engineers; should have served an approved apprenticeship training in power plant engineering; and should have had at least 10 years' experience in connection with steam power station operation and/or construction.

Salary according to qualifications and experience in the range £900-£1,200 per annum. The post is superannuable.

Apply in writing, giving full particulars (in chronological order) of age, education, qualifications and experience (with dates), to National Coal Board, Establishments (Personnel), Cobart House, Grosvenor Place, London, S.W.1, marking envelope TT/304. Original testimonials should NOT be forwarded. Closing date 21st April, 1951. 934

## BRITISH ELECTRICITY AUTHORITY

### East Midlands Division

### Assistant Shift Charge Engineer, Burton-on-Trent

APPLICATIONS are invited for the position of ASSISTANT SHIFT CHARGE ENGINEER at Burton-on-Trent Generating Station.

Applicants should have sound technical qualifications and experience in the operation and maintenance of modern power stations.

The salary will be in accordance with Class E, Grade 9, and the appointment will be superannuable under the provisions of the British Electricity Authority and Area Boards Superannuation Scheme.

Applications should be submitted on the official form which may be obtained from the Divisional Establishments Officer, British Electricity Authority, Barker Gate, Nottingham, not later than 23rd April, 1951.

W. S. BURGE, Divisional Controller.
1033

## SOUTH WESTERN ELECTRICITY BOARD

APPLICATIONS are invited from suitably qualified and experienced persons for the position of THIRD ASSISTANT ENGINEER in the Devon Sub-area, with headquarters at Exeter. Commencing salary within Class 9, Grade 10 (£539 to £561 per annum) of the N.J.B. agreement.

Candidates should have had considerable experience in the construction, operation and maintenance of supply networks and plant, and possess a technical qualification not less than graduate I.E.E.

The duties attached to this post include inter alia fault calculations and determination of protective settings; supervision of sub-area stock; assisting in planning and preparation of schemes and specifications; listing protective systems; liaison with contractors; and experimental work which may be initiated from time to time.

Applications, stating age, present position and salary, qualifications and experience, should reach the Sub-area Manager, South Western Electricity Board, 57, Paul Street, Exeter, within 10 days. 1057

## BRITISH ELECTRICITY AUTHORITY

SHIFT CHARGE ENGINEER, Epsom Power Station. Experience in the operation of power station plant and E.H.T. switchgear essential. Associate membership of the Institute of Electrical or Mechanical Engineers or equivalent preferable. N.J.B. Conditions and salary Class A, Grade 7, £455 per annum inclusive of London allowance. Applications on forms obtainable from Divisional Secretary, B.E.A., S.E. Division, Lower Ham Road, Kingston-on-Thames, to be returned by 14th April, 1951. 1032

## SKILLED ELECTRICIANS

APPLICATIONS are invited for three fully skilled ELECTRICIANS for Shift Maintenance duties at a large new Rolling Mill in the Neath area, South Wales. They should have a wide experience of installation and maintenance of H.T. and L.T., A.C. and D.C. rolling mill plant, including Ward Leonard and Tandem Mill control. Excellent prospects for suitable applicants. Apply to:—

THE SOUTH WALES ALUMINIUM CO. LTD.
Rheola Works, Resolven, Glam. 933

## LAMP MANUFACTURERS REQUIRE TECHNICAL STAFF

LAMP Manufacturers, Fluorescent, Incandescent and Miniature, require the following Junior and Senior Staff for their London factories. Unprecedented expansion of production programme necessitates appointments beyond normal up-grading within organisation.

JUNIOR TECHNICAL STAFF. Applications invited from (a) Technicians with experience in lamp or valve making; (b) University students or graduates with engineering and physics qualifications for fluorescent and incandescent departments.

SENIOR TECHNICAL STAFF. Applications invited from lamp engineers and technicians with experience of controlling processes for fluorescent and filament departments.

These posts are permanent and ultimately pensionable and offer prospects beyond the average. Apply—Box No. F.5825, A.K. Advg., 212a, Shaftesbury Avenue, London, W.C.2. 886

## KENT COUNTY COUNCIL

APPLICATIONS are invited for appointment in the Buildings Department of an ENGINEERING ASSISTANT (Electrical) at a salary in A.P.T. Grades I-III (£390-£495).

Applicants must be capable draughtsmen with practical experience in electrical installation work, and should preferably be Graduate Members of the Institution of Electrical Engineers.

The commencing grade and salary will be dependent upon qualifications and experience. The post is superannuable and the successful candidate will be required to undergo a medical examination.

Applications, on forms obtainable from the County Architect, Springfield, Maidstone, must be delivered to him within fourteen days of the appearance of this advertisement.

W. L. PLATTS,
Clerk of the County Council.

County Hall, Maidstone.
14th March, 1951. 831

## NORTH WESTERN ELECTRICITY BOARD

### No. 4 Sub-Area

### Appointment of Meter Repairers (Mechanicians)

APPLICATIONS are invited for the appointment of METER REPAIRERS (Mechanicians) in the No. 4 Sub-Area Testing Stations at Preston, Blackpool and Morecambe.

The wages and conditions of service will be in accordance with the Agreement of the National Joint Industrial Council for the Electricity Supply Industry, the present rate for Meter Repairer (Mechanician) being 36.50d. per hour, equivalent to £6 13s. 10d. for a 44-hour week.

Applications, stating age, training, experience and present post, should be received by the Manager, No. 4 Sub-Area, North Western Electricity Board, 40/41, Lune Street, Preston, not later than Saturday, 14th April, 1951. 980

## BRITISH ELECTRICITY AUTHORITY

### North Western Division

APPLICATIONS are invited for the position of SHIFT CHARGE ENGINEER at the Kearsley Generating Station, Stoneclough, near Manchester.

The salary range for this position, which is superannuable, will be £786/£822 per annum, in accordance with Grade 7, Class K, of the National Joint Board Agreement.

Candidates should preferably possess technical qualifications, and previous experience in a large modern generating station is essential.

Applications, stating age, qualifications, present position and giving full details of education and experience, should be received by the Establishment Officer, British Electricity House, Wilmslow Road, East Didsbury, Manchester, 20, not later than 14th April, 1951. 1004

## SWITCHGEAR DRAUGHTSMEN FOR JOHANNESBURG

APPLICANTS must have good practical and technical experience, particularly in diagram and schematic work. Single men preferred, age 22 to 25. Applications in writing, stating details of training, experience, age and salary expected, to—Employment and Welfare Manager, Johnson & Phillips Ltd., Victoria Works, Charlton, S.E.7. 1008

## NORTH WESTERN ELECTRICITY BOARD

APPLICATIONS are invited for the following appointments:—

### No. 1 Sub-Area

(a) THIRD ASSISTANT ENGINEER.
(b) GENERAL ASSISTANT ENGINEER.

(Sub-stations Section, Mains Engineer's Dept.)

(a) THIRD ASSISTANT ENGINEER. The duties will include the installation and maintenance of the following: Transformers up to 25 MVA; a wide range of types of switchgear for all voltages up to 33 kV; mercury arc rectifiers; rotary plant; ancillary equipment of all types.

The salary will be in accordance with the Revised Schedule of the National Joint Board, Class M, Grade 10, i.e., £727/£739/£751 per annum.

(b) GENERAL ASSISTANT ENGINEER. The successful applicant will be required to assist with the installation and maintenance of the following: Transformers up to 25 MVA; a wide range of types of switchgear for all voltages up to 33 kV; mercury arc rectifiers; rotary plant; ancillary equipment of all types.

The salary will be in accordance with the Revised Schedule of the National Joint Board, Class M, Grade 13, i.e., £590/£600/£610 per annum.

Applicants for both appointments should have had manufacturing experience, including "on-site" erection, and preference will be given to Corporate Members of the Institution of Electrical Engineers.

JUNIOR ENGINEERS

(Mains Engineer's Department).

Applicants should possess the Higher National Certificate in Electrical Engineering, or an equivalent qualification, and should have had a basic works training of not less than two years.

Successful candidates will be required to work in Manchester and surrounding districts, and will be given the opportunity to gain experience in various sections of the Mains Engineer's Department.

The salaries for the posts will be in accordance with the National Joint Board Revised Schedule, Class M, Grades 21-17, i.e., £375/£481 per annum.

GENERAL ASSISTANT DISTRICT ENGINEER

(South West District).

The principal duties will be to assist with the planning and development of the low-voltage distribution system. Applicants should have received technical training to Higher National Certificate level, and should have had practical experience in network development, cable installation and jointing.

The salary for the post will be in accordance with the National Joint Board Revised Schedule, Class E, Grade 11, i.e., £459/£467/£475 per annum.

Applications for the above appointments, stating age, qualifications and experience, present post and salary, should be received by the Sub-Area Secretary, North Western Electricity Board, Town Hall, Manchester, P.O. Box 493, not later than Saturday, 14th April, 1951.

### No. 2 Sub-Area

ASSISTANT TO THE SUB-AREA SALES SUPERINTENDENT.

Applications are invited for the above appointment in the Sub-Area Consumers' Engineer's Department, No. 2 Sub-Area Headquarters, Bolton.

Applicants should have experience of the supervision of service centres, organisation of exhibitions and demonstrations, and display.

The salary for the post will be in accordance with Grade 4 of the National Joint Council (Administrative and Clerical Grades) Salary Agreement for the Electricity Supply Industry, i.e., £510 × £20 — £570 per annum.

Applications, stating age, qualifications and experience, present post and salary, should be received by E. G. Wardle, A.M.I.E.E., Sub-Area Manager, No. 2 Sub-Area, North Western Electricity Board, National Buildings, St. Mary's Parsonage, Manchester, 3, not later than Saturday, 14th April, 1951.

### No. 4 Sub-Area

JUNIOR DRAUGHTSMAN.

Applicants should have had a good general education and preferably hold the Ordinary National Certificate in Electrical or Mechanical Engineering. Experience in connection with electrical switchgear, diagrams, sub-station layouts or building details would be an advantage.

The salary for the post will be in accordance with the General Clerical Grade of the Salary Agreement of the National Joint Council (Administrative and Clerical Grades) for the Electricity Supply Industry, i.e., £135 per annum at age 16, rising by annual increments to £310 per annum at age 26, and thereafter, subject to satisfactory and competent service, to a maximum of £385 per annum.

SECOND ASSISTANT DISTRICT ENGINEERS

(Preston District).

The successful candidates will be required to assist in the construction and maintenance of sub-stations and overhead lines, the laying and jointing of cables on high and medium voltage mains, and the operation and control of switching in the District, including standby duty.

Preference will be given to applicants who are Corporate Members or Graduates of the Institution of Electrical Engineers, or who hold equivalent qualifications.

The salaries for the posts will be in accordance with the National Joint Board Revised Schedule, Class F, Grade 7, i.e., £625/£634/£643 per annum.

Applications, stating age, qualifications, experience, present post and salary, should be received by the Sub-Area Manager, No. 4 Sub-Area, North Western Electricity Board, 40/41, Lune Street, Preston, not later than Saturday, 14th April, 1951.

### No. 5 Sub-Area

ASSISTANT, COMMERCIAL DEVELOPMENT.

Candidates should have experience in some of the following: Supervision of service centres; domestic and commercial load development; organisation of exhibitions and demonstrations; publicity, advertising and display; agricultural and horticultural applications.

The salary for the post will be in accordance with Grade 3 of the National Joint Council (Administrative and Clerical Grades) Salary Agreement for the Electricity Supply Industry, i.e., £450 × £20 — £510 per annum.

GENERAL ASSISTANT ENGINEER

(Agricultural Development).

Applicants should have experience in all applications of electricity to farming, horticulture and poultry farming, and be able to advise on plant and equipment for these requirements. Some theoretical knowledge of agriculture is desirable, and ability to give lectures would be an advantage.

The salary for the post will be in accordance with the National Joint Board Revised Schedule, Class J, Grade 13, i.e., £486/£496/£506 per annum.

Applications, stating age, qualifications and experience, present position and salary, and the appointment for which application is made, should be received by R. H. Harral, M.I.E.E., M.Inst.F., No. 5 Sub-Area Manager, North Western Electricity Board, Jubilee Street, Blackburn, not later than Saturday, 14th April, 1951.

### No. 6 Sub-Area

THIRD ASSISTANT ENGINEER

(Testing Department, Technical Section, Sub-Area Headquarters).

Applications are invited for the appointment of Third Assistant Engineer at the Carlisle Testing Station of the No. 6 Sub-Area.

Applicants should be fully conversant with the Electricity Supply (Meters) Act, 1936, and should have had experience in the following: Calibration, repair, testing and maintenance of all types of metering equipments; testing of voltage and current transformers; laboratory testing of protective gear; use of Class A testing station potentiometer equipment.

Candidates should hold the Higher National Certificate (or its equivalent) in Electrical Engineering.

The salary for the post will be in accordance with the National Joint Board Revised Schedule, Class H, Grade 10, i.e., £571/£584/£597 per annum.

THIRD ASSISTANT ENGINEERS

(Installation Testing and Meter Department)

(Barrow and Carlisle Districts).

Successful candidates will be responsible for the inspection and testing of installations, the fixing of meters throughout the respective Districts, and the keeping of all records in connection therewith.

Applicants should preferably have served an apprenticeship as an electrician and hold at least the Ordinary National Certificate, or equivalent, in Electrical Engineering. Experience in all classes of installation work and a thorough knowledge of the I.E.E. Wiring Regulations are essential. Experience in a meter test room will be an advantage.

The salaries for the posts will be in accordance with the National Joint Board Revised Schedule, Class E, Grade 10, i.e., £488/£495/£502 per annum.

Applications, stating age, experience, qualifications, present post and salary, should be received by the Sub-Area Manager, No. 6 Sub-Area, North Western Electricity Board, Castle Green, Kendal, not later than Saturday, 14th April, 1951. 979

A MODERN works manufacturing rubber and paper insulated cables, etc., has a vacancy for a qualified and experienced production manager. The position offers good prospects of promotion. Superannuation scheme available. Applicants should state age, experience, and salary required to—Box 9654.

## MIDLANDS ELECTRICITY BOARD

### Shropshire and Herefordshire Sub-Area

APPLICATIONS are invited for the position of DRAUGHTSMAN at the Sub-Area Offices, Shrewsbury. The duties will consist of the preparation of working and detailed plans for sub-station buildings and switchgear layout. Some architectural experience will be an advantage.

The salary will be £375 per annum, which is provisional and subject to negotiation with the appropriate organisation.

Applications, stating age, qualifications, experience and present employment, should be sent within fourteen days to W. Winwood, Manager, Shropshire and Herefordshire Sub-Area, Midlands Electricity Board, Spring Gardens, Ditherington, Shrewsbury.

21st March, 1951. 958

## AIR MINISTRY

### Designer/Draughtsmen

APPLICATIONS are invited for the positions of DESIGNER/DRAUGHTSMEN in the Designs Branch of the Works Department in mechanical and electrical engineering. Vacancies are mainly in London but there are some in the provinces. If desired, consideration would be given to making appointments for London only. Salaries are on ranges up to £625 with starting pay in accordance with age and qualifications. Applications, stating age, qualifications, previous appointments (with dates), should be sent to—Air Ministry (S.2.H.), Cornwall House, London, S.E.1, from which address further details may also be obtained. 491

## ELECTRONIC MECHANICS

WANTED for employment in various Establishments of the Ministry of Supply, Craftsmen experienced in the installation, operation, repair and maintenance of Radio, Radar, Signal, Fire Control and other electronic equipment. Applicants must have had wide experience of such work.

Wages according to skill and experience from 139/- to 155/-, with opportunities for advancement up to 173/6 (London), 171/- (Provinces) for 44-hour 5-day week.

Applications, giving full particulars of age, apprenticeship, training, experience and qualifications, to: Assistant Director, T.P.A.2, Ministry of Supply, Ivybridge House, John Adam Street, London, W.C.2. 1035

## JOHNSON & PHILLIPS HAVE VACANCIES FOR THE FOLLOWING STAFF IN THEIR TRANSFORMER DEPT.:

(1) A TRANSFORMER DESIGNER experienced in dealing with all sizes up to 10 MVA.

(2) DRAUGHTSMEN capable of handling all medium sizes up to 2,000 kVA, alternatively 5,000 kVA.

(3) A DRAUGHTSMAN with experience of larger transformers up to 30/45 MVA.

Write, stating age, experience, salary expected, to Employment & Welfare Manager, Johnson & Phillips Ltd., Victoria Works, Charlton, London, S.E.7. 1009

## SWITCHGEAR

JOHNSON & PHILLIPS Ltd. require two SENIOR DRAUGHTSMEN. Applicants must be suitably qualified and competent to handle switchgear for indoor and outdoor main stations and sub-stations up to 33,000 v., or to design switchgear apparatus embracing air break and oil break circuit breakers. Both positions offer good scope to the right man with prospects of early promotion. Applications in writing, stating age, experience and salary required, to—Employment and Welfare Manager, Johnson & Phillips Ltd., Charlton, London, S.E.7. 932

A CHIEF electronic engineer small laboratory; product engineer instruments and electronics, B.Sc. preferred (Scotland); development engineer marine radio; chief draughtsman power house work; electronics engineer (Slough); draughtsmen and tracers; testers f.h.p.; electronics and radar development engineers; transformer designers and testers; physicists; motion study engineers. Many other positions vacant.—Technical Employment Agency, 179, Clapham Road, London, S.W.9 (Brixton 3487). 1017

ABERDARE CABLES Limited, Aberdare, require several estimators with experience in handling home and overseas enquiries for paper-insulated cables. State age, experience and salary required. 744

A.C. and D.C. house service meter tester and repairer. London, S.W.—Box 137.

ALL grades of draughtsmen are required by well-known manufacturer for a new drawing office shortly to be opened in South Lancashire. Draughtsmen with good light/medium mechanical engineering experience preferably with some knowledge of design for quantity production are invited to apply. These are permanent positions offering good prospects on new types of electro-mechanical equipment. Write giving full details, mentioning ref. AFC, to—Box 925.

AN assistant engineer is required for work in connection with the application of semi-conductors (in particular, voltage dependent materials) to industry. Applicants must be of Higher National to degree standard. Salary according to age, qualifications and experience. Reply, giving full particulars, including age, education, experience, qualifications, etc., marking envelopes "Research," to—Personnel Manager, Metropolitan-Vickers Electrical Co., Ltd., Trafford Park, Manchester, 17. 1042

AN electrical engineer experienced in design of transformers or complete rectifiers of small and medium output required by leading British manufacturer. Modern factory with excellent amenities. Good prospects for a well-trained and ambitious man. Attractive salary with annual bonus and contributory pension scheme. Write, giving full details, to—Box 936.

APPLICATIONS are invited by the English Electric Co. Ltd. for vacancies as senior circuit breaker designers at their Stafford works. Tenancies of houses or flats may be offered in appropriate cases. Applications, with full particulars and quoting ref. 249C, should be addressed to—Central Personnel Services, English Electric Co. Ltd., 24/30, Gillingham Street, London, S.W.1. 987

APPLICATIONS are invited for positions in the Acton switchgear drawing office of the English Electric Co. Ltd. from suitably experienced mechanical or electrical draughtsmen. Whilst experience in this class of work is desirable, it is not essential. Write, giving full particulars and quoting ref. 112F, to—Central Personnel Services, English Electric Co. Ltd., 24/30, Gillingham St., London, S.W.1. 846

APPLICATIONS are invited for the following positions in the London area: Development engineers required by manufacturers of A.C. and D.C. electrical equipment for aircraft. Applicants should hold at least a Higher National Certificate or preferably an engineering degree. The positions are superannuated and give considerable scope to men with adequate experience. Write, giving full details in strictest confidence, to—The Employment Officer, Rotax Ltd., Chandos Road, Willesden Junction, London, N.W.10. 850

APPLICATIONS are invited for the following positions in the London area: Draughtsmen required for detail drawing of experimental designs of aircraft electrical equipment. Works experience essential. Write, giving full details in strictest confidence, to—The Employment Officer, Rotax Ltd., Chandos Road, Willesden Junction, London, N.W.10. 851

APPLICATIONS are invited for the post of assistant inspector to the Ceylon Fire Insurance Association in Colombo. Applicants should have had comprehensive training in electrical engineering, embracing a five years' apprenticeship and general experience in installation work, particularly in connection with wiring for lighting and power and possess a sound general knowledge of mechanical engineering and building construction. Candidates should be about 30 years of age, preferably single, well educated and of good address. Applications and enquiries should be sent to—The Secretary, Fire Offices' Committee (Foreign), 65, Watling Street, London, E.C.4. 9649

APPLICATIONS are invited from fully qualified practical electrical engineers between the ages of 30 to 40 for a position of trust in a modern manufacturing concern in the West London area. Only those applicants who have had control of labour and experience in modern electrical equipment need apply. Graduate students with degrees will be considered. The position, which is senior, is well paid and qualifies for superannuation. Applicants should state confidentially their age, experience, qualifications, both theoretical and practical, to—Box 834.

ARMATURE winder and improver for repair shop, A.C. and D.C. repairs, S.W.6 area.—Box 845.

BOILER house manager, age 25-35, required by a large and modern industrial company in North-West England. Applicants should possess a thorough knowledge of, and experience in, the operation and maintenance of high-pressure automatic stoker-fired water tube boilers and their auxiliaries, and should have Higher National Mechanical Certificate or First Class Board of Trade Certificate in Steam. An attractive commencing salary will be offered. To the right man this is a permanent, progressive and pensionable appointment. Replies will be treated in strict confidence. Please send brief particulars of age, experience, etc. to—Box 1040.

ASSISTANT required by large firm in Aden to handle electrical, automotive and radio (including marine) business. Some practical experience of the wholesale or retail trade in electrical and radio appliances desirable; radar and/or refrigeration experience helpful but not essential. Board, quarters and free passages to and from Aden provided. Salary about £400 p.a., according to qualifications and experience. Apply, giving full particulars, to—Box 964.

BOILER operator required for new water tube boilers. Mechanical stoking and coal handling. Applicants should have knowledge of combustion controls. 44 hours, shift work, full trade rates. Apply in writing, giving details of previous experience, to—Chief Engineer, Guy's Hospital, London, S.E.1. 873

BRITISH ENGINE BOILER & ELECTRICAL INSURANCE Co. Ltd., 24, Fennel St., Manchester. 4. Applications are invited for the permanent appointment of head office assistant electrical engineer. Commencing salary from £400 according to qualifications; progressive increases. Non-contributory pension. Candidates should be aged 22-24 and have served an apprenticeship with a leading manufacturer of electrical machinery, transformers and switchgear. Practical experience of the industrial application of electrical equipment an advantage. Graduate membership of the Institution of Electrical Engineers is essential. Applications should state age and give full particulars of training and experience. 968

BRITISH ENGINE BOILER & ELECTRICAL INSURANCE Co., Ltd., 24, Fennel St., Manchester 4. The company has a vacancy for an electrical plant inspector in Watford. Permanent position carrying progressive salary scale £450 to £650 and non-contributory pension. Candidates age 26 to 33 years, with apprenticeship in the manufacture of electrical machinery and preferably with subsequent experience of repairs and industrial use of electrical machinery and who have gained the Higher National Certificate in Electrical Engineering or are Grad.I.E.E., are invited to apply in own handwriting stating age, qualifications and experience. 1039

COMMERCIAL technical assistant required by lamp manufacturers, E.L.M.A. members, for commercial dept. in Central London. Good education and electrical knowledge to Nat. Cert. standard, with experience of lamp commercial work and sales correspondence. Lighting knowledge an advantage. Age 25/30. State full particulars and salary required to—Box 895.

COST clerk experienced electrical contracting work (desirable) required by large London firm of electrical engineers and contractors. State age, experience and salary required.—Box 825.

COST clerk. Small electrical engineering firm in Manchester requires a cost and stores ledger clerk. Good knowledge of casting essential, must be able to work on own initiative. Student of recognised institute preferred. Permanent situation for suitable applicant. Reply with references, age, wages required, etc.—Box 9651.

DESIGN draughtsman (senior) experienced in instrument design required by large light engineering company, East London district. Apply in writing, giving age, previous experience and salary required, to—Box 1019.

DESIGNER-draughtsman, aged 28/35. Sound knowledge light electro-mechanical apparatus. Used to handling detailing draughtsmen. Education at least H.N.C. standard. Old-established and highly reputed firm of instrument and telegraph engineers, S.E. area. Applications, with full particulars of age, experience and salary required, to—Box 961.

DESIGNER-draughtsman (senior) experienced in the design of light electro-mechanical equipment is required by a well-known electrical manufacturing company at an establishment in the Harrow-Wembley district. Work is interesting and varied and situation permanent. A commencing salary of £600 per annum is offered to an experienced draughtsman who has served a recognised works apprenticeship or similar training course and possesses technical qualifications not less than H.N.C. standard. Apply, stating age, training, experience, etc., to—Box 967.

DESIGNER-draughtsman (senior) required with knowledge and experience of the design and production of light electro-mechanical equipment. Work interesting and varied and offers good scope to a fully experienced draughtsman. Applicants must have served a recognised works apprenticeship or similar training course and possess technical qualifications not less than H.N.C. standard. Pension scheme in operation and working conditions good. Applications must be made in writing, stating age, training, experience and salary required, to—Chief Engineer, Siemens and General Electric Railway Signal Co. Ltd., Fast Lane, Wembley. 966

DRAUGHTSMAN (electrical) required in the engineering dept. of department store. State salary and experience. Apply—Chief Engineer, Lewis's Ltd., 21, Leigh Street, Liverpool, 1. 963

DESIGNER-draughtsman with sound knowledge of small mechanical and electrical appliances, able to work on own initiative. Permanency, pensionable. N.1 district. State age, experience and salary required.—Box 965.

DEVELOPMENT engineer for old-established firm of precision electrical instrument makers in S.E. area. Applicants should have good electrical and mechanical training on precision instruments and knowledge of data transmission equipment, servos and electronics. The position is a responsible one requiring a man with ability to supervise and direct staff. Salary from £750 according to experience. Applications giving full particulars of age experience and salary required to—Box 1041.

DRAUGHTSMAN, aged 21/26, for instrument and kindred electro-mechanical apparatus design and detailing. Workshop experience. Education to O.N.C. standard or higher. Good opportunity for young man to gain wide experience, Beckenham area. Applications, giving full particulars of age, experience and salary required, to—Box 962.

DRAUGHTSMAN (electrical wiring) with experience of small Admiralty vessels and some knowledge of small electrical marine work an advantage, for Hull district. State experience, age and wage required to—Box 839.

DRAUGHTSMAN (electrical) with good technical training and practical experience, possessing a sound knowledge of E.H.V. and L.V. switchgear, motor control gear, power distribution systems for heavy industrial plant, etc. Write, giving full details and salary required, to—The Secretary, Imperial Chemical Industries Ltd., Lime Division, Royal Exchange, Buxton. 883

DRAUGHTSMAN req'd for designing loudspeakers and microphones. Previous experience desirable though not essential. Please apply in writing to—Vitavox Ltd., Westmoreland Rd., London, N.W.9. 985

DRAUGHTSMEN, junior and senior, wanted urgently for layout and design work of automatic motor control gear. Good pay. Canteen facilities. Apply — Electro Dynamic Construction Co. Ltd., Control Gear Division, Bristol Road, Bridgwater. 821

EDUCATION officer. Assistant to the education officer of British Insulated Callender's Cables Limited, with particular reference to the recruitment, selection and training of apprentices of all grades. Applicants should have the necessary qualifications leading to Corporate Membership of the I.E.E. or I.Mech.E., including workshop experience. Outside interests in youth organisations would be an added recommendation. Age preferably 30/35; location Prescot works. Applications in writing to be submitted to the Staff Officer, B.I.C.C. Ltd., Prescot, Lancs. 1038

ELECTRICAL contractors in Manchester area require assistant to manager. Applicants must have held similar position and be fully conversant with all classes of large electrical installations. Apply, giving full details of experience, age and salary required, to—Box 9634.

ELECTRICAL designer-draughtsmen required. Experienced in design of installations for factories and public buildings. Commencing salary £500/£600 per annum. Full details to—Hoare, Lea & Partners, Consulting Engineers, 32, Deansgate, Manchester, 3. 819

ELECTRICAL draughtsman for lift engineering, with experience of contactor switchgear for medium pressure handling up to 40 h.p. Knowledge of control circuit wiring an advantage. Non-contributory superannuation scheme. Five-day week. Expenses paid for interviews.—Box 989.

ELECTRICAL engineer, age 25-30, with degree or equivalent qualifications in electrical engineering, required for chemical plant in Home Counties. Duties involve planning, installation and maintenance of a wide variety of electrical equipment, including A.C./D.C. conversion apparatus on a large scale. Some practical training is desirable but not essential. Pension scheme and good prospects of advancement. Write, stating age, qualifications, training and salary required, to—Box 990.

ELECTRICAL engineer draughtsman required with experience in the design and installation of power and lighting schemes, distribution and control diagrams, etc. Excellent prospects for suitable man offered by Tees-side firm. Apply giving full particulars, quoting reference F.D. to—Box 1043.

ELECTRICAL engineer wanted for service in U.K. on technical side of sales department of a storage battery company. Preferably man with experience with switch gear, traction or light electrical (but not electronic) equipment, age 22-28, graduate I.E.E., fit and mobile. The position has widely varied technical interests and good prospects. Apply, with full details of training and experience, to—Box ER.926, L.P.E., 110, St. Martin's Lane, London, W.C.2. 761

ELECTRICIAN wanted for maintenance, installation, etc., of electrical equipment in laundries, London area. Please write, stating age, experience, wages required, to—Box E.R.739, at 191, Gresham House, London E.C.2. 959

ELECTRICAL engineer, university graduate, not over 25, required for Glasgow head office of large manufacturing company to design and prepare estimates and specifications for factory power and lighting installations. Permanent, superannuated post. Applicants should state age, qualifications and experience and quote reference D/EE.—Box 974.

ELECTRICAL engineers and contractors require experienced estimator for Midland office. Experience with Government contracts an advantage.—Box 991.

ELECTRICIANS with general contractors' experience; local work; permanent position offered to good men. Apply — Knight's (Hendon) Ltd., 42, Watford Way, N.W.4. 133

ELECTRONIC motor control design engineer required. Applicants should have had previous experience in this field and have a power engineering background. Apply—Staff Manager, General Electric Co. Ltd., Witton, Birmingham, 6. 940

ENERGETIC sales manager with good industrial and H.V. distribution connection for L.V. and H.V. switchgear up to 11 kV, 250 MVA. Midlands area. Apply with full particulars and salary required—Box 836.

ENGINEER, H.N.C. standard, to undertake experimental work on small special electrical machinery and apparatus. S.E. London. Give qualifications, experience and salary required to—Box 984.

ENGINEERS with experience in system study and network analysis are invited to apply for vacancies with the English Electric Company at their Stafford works. Full details of qualifications and experience, stating whether married or single, quoting ref. 473, should be addressed to—Central Personnel Services, English Electric Co. Ltd., 2/30, Gillingham Street, London, S.W.1. 988

ESTIMATING engineer required by large electrical contractors, Manchester area. Must have held similar position and be capable of dealing with all types of large electrical installations. Apply, giving full details of experience, age and salary required, to—Box 9635.

EXPERIMENTAL. First-class instrument maker required for experimental department. Experience with small mechanisms and diaphragm units associated with aircraft instruments essential. A knowledge of electrical and electronic devices would be an advantage. Write in first instance, giving full particulars of age and experience and rate required, to—Mechanism Ltd., 6a, George St., Croydon. 960

FEMALE cost clerk for electrical contractors, Westminster, preferably with experience of electrical terms. Please state experience and salary required.—Box 892.

FIRM of consulting and manufacturing engineers require a number of senior, intermediate and junior electrical, electro-mechanical and mechanical draughtsmen for armament project work in their Bath and Weston-super-Mare offices. Good-class lodgings are available to single and married applicants, also flatlets. Come and work in the beautiful West Country. Good salaries will be paid to successful applicants.—Box 994.

FIRST-class tool designer-draughtsman required by leading firm of switchgear manufacturers. Only persons of the highest experience in modern production methods, including progressive tool design, will be considered. Salary required and details of experience to—Box 869.

FOREMAN. Applications are invited for the position of foreman in the Sub-Area Meter Repair Department, No. 1 (Southall) Sub-Area, Waterloo Road, Uxbridge. Candidates should be capable of taking charge and supervising the work of a large meter repair department, and have had superior experience in the repair of all types of single and three-phase meters, in particular prepayment and two-part tariff meters, maximum demand attachments, instruments and time switches. Some manufacturing experience would be an advantage. Conditions of service and rates of pay in accordance with the National Joint Industrial Council Agreement dated 20th July, 1949. Applications, stating full details of qualifications, experience, age, etc., should be addressed to the Sub-Area Engineer, Southern Electricity Board, No. 1 (Southall) Sub-Area, Waterloo Road, Uxbridge, Middlesex, not later than 13th April, 1951. Short-listed applicants will be interviewed on the 23rd April, commencing at 10.30 a.m. 1015

FOREMAN electrician required to take charge of planning and installation of all electrical work on large civil engineering contract in North Wales. Power installations and maintenance of all electrical plant, only men with similar experience need apply. Accommodation. Subsistence allowances. Salary according to experience. Full particulars—Box 921.

FOREMAN linesmen required for contract work in Uganda. Previous exp. abroad an advantage. Age limit 40.—Box 713.

FOREMEN and electricians and electrical draughtsmen thoroughly experienced all types electrical installation work; lorry drivers, London and country work, required by large firm electrical engineers and contractors. Good prospects. State age and experience.—Box 823.

FULLY experienced chief draughtsman-designer required by leading switchgear manufacturers. Capable of taking charge of all final drawing development work and of staff. Experience in design work of the highest technical standards essential. Salary required and full record of experience to—Box 868.

GENERAL foreman required by old-established electrical contractors, S.W. London. Must have first-class experience all systems. Primary responsibility, labour control and direction. Permanency for right man, with excellent staff conditions and pay. Car an advantage, but clean driving licence essential. Reply in confidence to—Box 923.

HOOVER Limited, domestic electrical appliance manufacturers, require for their main plant department at Perivale, Middlesex, a plant foreman for installation and maintenance of boilers (oil-fired) for heating and processing; ventilation and dust extraction; water sanitary and general service plant and equipment. In addition to apprenticeship, should hold a minimum qualification of National Certificate (mech.). Preference to those between 30 and 40 years of age, but others with exceptional qualifications will be considered. Written applications, giving full details of training, experience and age, should be addressed to—The Employment Officer, Hoover Limited, Western Avenue, Perivale, Middx. 970

HOOVER Limited require an engineer for the time and motion study department at their main works. Applicants should have had an engineering apprenticeship and at least five years' experience in speed and effort rating on every element. Some motion and methods study is involved. Suitably qualified men are invited to write, giving full details of age, education, qualifications and experience, to—The Employment Officer, Hoover Limited, Western Avenue, Perivale, Middx. 969

HOUSE available for chargehand, elec. assembly dept.; wanted by electric vehicle mfrs. Excellent opportunity with growing co. for right man with previous experience in light and medium elec. assembly. Must have organising powers, initiative and ability to get out production. 1 hour London. Apply, with full particulars, to—Box 937.

INDUSTRIAL truck mfrs. have exceptional opening providing scope for use of drive and practical as well as supervisory exp. as electric department chargehand, on assembly. Please write all details, including age, qualifications, exp., whether single or married, salary, to—Box 938.

JOINTER (plumber) thoroughly experienced H.T. and L.T. cable jointing required London and country work by large firm electrical engineers and contractors. State age and experience.—Box 824.

JUNIOR diagram draughtsmen required in London with experience of H.T. switchgear and modern power station practice. When applying, please state age and experience. —Box 48.

JUNIOR electrical engineers, age 20/25, with regular electrical training and qualifications, preferably Higher National, to train as switchgear sales engineers. Rapidity and extent of advancement will depend on ability of successful applicants.—Ferguson Pailin Ltd., Higher Openshaw, Manchester, 11. 870

LABORATORY apprentice wanted, age 16-18. School leaving certificate or equivalent; interested in varied electrical experiments. Send full details to—The Record Electrical Company Limited, Broadheath, Altrincham, Cheshire. 806

LABORATORY assistant wanted, Inter.B.Sc., Higher National Certificate or equivalent standard. Required for electrical experimental work. Send details of age and experience to—The Record Electrical Company Limited, Broadheath, Altrincham, Cheshire. 807

LAMP making: Wanted, foreman to take full responsibility for the quantity and quality of production in stem-making section of lamp works, handling a large variety of stems on a full range of machines, including hand, semi-automatic and fully automatic. Only men with full experience need apply and a substantial salary will be paid. Housing assistance, if required, will be given to the successful candidate and superannuation benefits are available.—Box 867.

LIGHTING engineer required by lamp and lighting equipment manufacturers, E.L.M.A. members, to prepare commercial and industrial lighting specifications. Central London office. Nat. Cert. E.E. and I.E.S. member preferred, age 25/30. Experience essential. Assistants provided. State full particulars and salary required to—Box 896.

LINESMAN, overhead, experienced, required contract North Borneo, 12 months, excellent conditions, large firm electrical engineers and contractors. Write age and experience.—Box 946.

MALAYA: Electrical engineer (sales), graduate or equivalent, age under 30, preferably single. Salary according to qualifications and experience. Apply in writing, giving full details, to—Alliance (Malaya) Engineering Ltd., 15, Bishop's Bridge Rd., London, W.2. 718

MANAGER for electrical retail and contracting business in South-west required with view to managing directorship with £2,000 investment when so appointed. Salary £500 p.a. with commission and travelling expenses. —Box 9650.

MANUFACTURERS of electrical cooking and heating equipment require draughtsman for industrial design and development work, Birmingham. Reply, stating age, experience and salary, to—Box 1010.

MIDLANDS technical sales representative, able start soon. Own car and outstanding personality essential, must be hard working. Salary, expenses and commission. Connections exist. Apply in writing, full details and testimonials.—Man. Dir., British Central Electrical Co. Ltd., 6, Rosebery Avenue, London, E.C.1. 904

PLANNING and supervising engineer required for expanding electric supply corporation in West Pakistan. Applicant should have had a wide and continuous practical experience in the design, operation and maintenance of a growing supply undertaking's industrial and rural network of overhead lines and underground cables at voltages up to 66 kV. Preference will be given to applicants in possession of a university degree in electrical engineering or other technical qualification of equivalent standing, or to Corporate Members of the Institution of Electrical Engineers. Salary according to qualifications. Leave and passage terms will be in keeping with qualifications. Successful applicant will be expected to enter into an agreement for a period of at least three years. Apply, stating salary expected, to—Box 943.

PLANT maintenance engineer for motorised woodworking plant in factory. Apply in writing, stating age, experience, salary, etc., to—Secretary, James Longley & Co. Ltd., Crawley, Sussex. 1037

POST-graduate heavy electrical engineering apprenticeships. The General Electric Co. Ltd., Witton, invite applications for the above training from men possessing a degree in engineering who have been or will shortly be released from military service. A few vacancies available in special cases for direct employment. Write for further details to—The Education and Training Office, The General Electric Co. Ltd., Engineering Works, Witton, Birmingham, 6. 837

POWER plant charge engineer required by major oil company for employment in the Middle East to operate a combined gas and steam turbine station where he will take charge of a shift. Applicants, who should be under 30 years of age, must possess a Higher National Certificate in electrical engineering and have served an apprenticeship in the generation division of a power supply organisation undertaking power station control room operation, followed by experience as a boiler house or turbine room charge engineer. Attractive salary plus generous allowance in local currency designed to assist substantially in meeting cost of living, free passages, kit allowance, free medical attention, good leave arrangements, pension scheme. Write, stating personal particulars and details of qualifications and experience, quoting Dept. F.13.F, to —Box 3337, at 191, Gresham House, London, E.C.2. 191

POWER transformer estimating engineer required immediately. Age about 25. One holding Higher National Certificate preferred. Apply, stating age, experience and salary required.—Box 942.

REPRESENTATIVE for E.W.F. wholesaler to work in the Surrey/Sussex area. Previous experience an advantage. Apply—E. Dawson Limited, 16a, London Road, Reigate (Telephone 2928). 1013

REQUIRED: Electronics/electrical designer, take charge design and dev. wide range covering electronic welding and process controls, small spot welders, rectifier units up to 50 kW. Valve and relay circuitry experience essential. Should have degree or equivalent, with practical outlook. State age, experience and salary required.—Hirst Electronic Development Ltd., Dermody Rd., London, S.E.13. 992

RESPONSIBLE electrical sales engineer required by well-known company to act as chief sales representative in the Midlands area. A remunerative appointment with excellent prospects offered to the right man. Must know the territory thoroughly, with good connections amongst electrical manufacturers, wholesalers and contractors. Applications with full particulars, please, to—Box 1018.

SALES and estimating engineer required for electric motors and associated equipment principally for export markets, by well-known firm in Westminster. Excellent prospects for engineer with initiative and energy. Please state technical and commercial experience, age and present salary.—Box 9664.

SALES manager required by manufacturers of electrical resistance materials. The post calls for a man, preferably under 40, experienced in the electrical trade and capable of negotiating at high level by personal contact. Please submit full details in confidence to—General Sales Manager, Hall & Pickles Ltd., 70, Victoria St., London, S.W.1. 1016

SALES representative with connection amongst electrical contractors and Area Boards. Salary, commission and expenses. Car necessity. Full details of experience, etc., in confidence to—Box 746.

SENIOR draughtsmen with up-to-date experience of H.T. switchgear wanted. Please state qualifications, age and salary required. Apply—The New Switchgear Construction Co. Ltd., Wellesley Rd., Sutton, Surrey. 809

SERVICE engineer required for cinema sound reproducing equipments installed throughout North London area. Applicants should be car owner-driver or able to provide car and telephone. Good practical experience with light electro-mechanical equipment and knowledge of audio amplifiers essential. Training period arranged in company's London works. Salary scale £375/£425 per annum plus car allowance. State full details, age, education, experience and when available.—Box 852.

SEVERAL vacancies exist in the development laboratory of the General Electric Co. Ltd., Witton, for development engineers in the electronics, small motor engineering and high-power switchgear test sections. Applicants should preferably possess a degree or Higher National Certificate in electrical engineering, but those taking their final examination this year will also be considered. Salaries will depend upon qualifications, age and experience. Apply in writing, giving full particulars, to—Staff Manager, General Electric Co. Ltd., Witton, Birmingham, 6. 1014

SOUTH WALES SWITCHGEAR Ltd., Blackwood, Mon., have vacancy for chief storekeeper. Please send applications stating age, experience and salary required. 1036

STORES superintendent required for North London radio factory. Able to organise and manage group of component and raw materials stores. Applications considered only from men at present holding such a position. Salary in the neighbourhood of £500 per annum according to experience is offered to a first-class storekeeping organiser capable of acting on own initiative. Permanent, progressive and pensionable staff appointment. Apply—Box F5956, A.K. Advg., 212a, Shaftesbury Ave., London, W.C.2. 993

SWITCHGEAR engineer for head office, Manchester, to handle enquiries and orders for power and sub-station equipment. Previous switchgear experience essential. Write, giving full details of technical qualifications and experience. — Ferguson Pailin Ltd., Higher Openshaw, Manchester, 11. 871

SWITCHGEAR specialists require contract engineers for Manchester works to prepare engineering projects up to 132 kV on H.V. systems in Canada, South Africa and Australia, in addition to B.E.A. contracts. Attractive salary commensurate with experience. Reply in confidence, stating age, experience and salary, to — The General Manager, Messrs. Cooke & Ferguson Limited, Openshaw, Manchester, 11. 776

TECHNICAL assistant for research and development in S.W. London light engineering works. Should have practical works training and have at least Ordinary National Certificate. Experience on electronic motor test, electronics and plastics advantageous. Excellent prospects for a suitable man. Write, stating age, experience, education and salary required, to—Box 1012.

TECHNICAL assistant with knowledge of structural design of overhead line supports and street lighting columns required by firm manufacturing steel poles. Experience of estimating in connection with light structural steelwork essential. The situation is in the Birmingham area. Canteen facilities, pension scheme and five-day week are in operation. Apply, stating age, experience, training and salary required, to—Box 842.

TEST engineer holding Ordinary National Certificate required for special testing and development work on transformers up to 500 kVA. Excellent prospects. S.W. London area. Apply, stating age, experience and salary required, to—Box 944.

TESTER for electric motors required, must be experienced all types electric motors, A.C. and D.C., up to 15/20 h.p. Apply in person—Personnel Dept., Lancashire Dynamo & Crypto, Acton Lane, Harlesden, N.W.10. 1011

THE BOWATER PAPER CORPORATION Limited require one or two electrical draughtsmen. Applicants must have had some experience of layout of substations and plant and must have the Higher National Certificate or equivalent. Apply in the first instance, stating salary required, to—The Chief Engineer, The Bowater Paper Corporation Limited, Northfleet, Kent. 929

THE BRUSH ELECTRICAL ENGINEERING Co. Ltd., Loughborough, have vacancies in their transformer department for draughtsmen with good basic training in general engineering. Previous transformer experience not essential. Excellent opportunities for advancement under good working conditions for the right type of men. Applicants should write, giving full details of training, experience, etc., to—Central Labour Dept. 935

THE ENGLISH ELECTRIC Co. Ltd. invites applications from suitably qualified and experienced electrical engineers for vacancies in connection with protective relay applications at their Stafford works. Details of age, education, training and experience, stating whether married or single, should be submitted, quoting ref. 871, to—Central Personnel Services, English Electric Co. Ltd., 24/30, Gillingham Street, London, S.W.1. 986

TRAINED electrical engineer required by leading civil engineering contractors to take charge of planning and installation of all electrical work on large contract sites, home and abroad. Power installations up to 1,000 kVA. and maintenance of all electrical plant. Based in London area. Only practical men with similar previous experience need apply. Salary according to experience. Full particulars—Box 922.

TRANSFORMER fitter required. Experienced in assembly of small single- and 3-phase units.—Stewart Transformers Ltd., 1021, Finchley road, N.W.11. 601

W. D. & H. O. WILLS invite applications for an assistant electrical engineer for service in Glasgow (after training in Bristol or elsewhere), having the following qualifications: Under 35 years of age; university or equivalent engineering degree and works training, mechanical and electrical; wide experience in electrical installation and maintenance work in large factories in the light engineering category. Permanent position subject to medical examination. Apply, with covering letter in manuscript, to W. D. & H. O. Wills, Department 9, Bedminster, Bristol, 3, marking envelope "A.E.E." 941

WANTED, senior designer-draughtsman accustomed to design of electrical control gear up to 10 h.p. Good conditions and pension scheme. Replies, stating age, experience and salary required, to—Messrs. Lockers (Engineers) Ltd., Warrington, Lancs. 939

WANTED, young electrical engineer for estimating work in Westminster. Experience with rectifiers, switchboards, batteries desirable. Please state full qualifications, details of training and salary required.—Box 847.

WIREMAN, experienced G.P.O. methods, able to work from schematic drawings, knowledge of amplification wiring an advantage. Salary according to experience. Apply in writing to—R.C.A. Photophone Ltd., The Tower, Brook Green Road, Hammersmith, W.6. 1056

WORKS manager required for East Midland firm manufacturing high-class electronic components. Applicant must be conversant with requirements of production routine and methods. Give details of experience and present salary.—Box 9660

WORKS superintendent for factory manufacturing fractional horsepower motors and equipment. Must be fully experienced in the production and design of all types of small electric motors. Good prospects, East London area. Write, giving age, experience and salary required. —Box 983.

YOUNG lady with drawing office experience required for drawing looms and diagrams for aircraft electrical systems. Write, stating age and details of experience, to—Staff Officer, Handley Page Ltd., Cricklewood, London, N.W.2. 712

## APPOINTMENTS FILLED

Dissatisfaction having so often been expressed that unsuccessful applicants are left in ignorance of the fact that the position applied for has been filled, may we suggest that Advertisers notify us to that effect when they have arrived at a decision? We will then insert a notice free of charge under this heading.

BOX 610—Electrician. All applicants are thanked.

## SITUATIONS WANTED

### OVERSEAS, BUSINESS & RESEARCH EXPERIENCE

QUALIFIED ELECTRICAL AND ELECTRONICS ENGINEER experienced in business abroad and research is available for appointment offering attractive salary and opportunity for advancement. Has excellent service record with major companies. Will discuss various ways of fitting into your organisation. Please write:—
**Box 9662**

ARMATURE winding shop foreman, thoroughly experienced winding, fitting, turning, A.C./D.C., fractional to 500 h.p., manufacturing or repair shop, desires change. —Box 9667.

ASSISTANT engineer (42) desires change, seeks responsible and progressive appointment with scope for initiative, London area. Wide experience in industrial and domestic installations, general administration, supervision, preparation of tenders, etc.—Box 9606.

ELECTRICAL foreman (41) accustomed to high-class work seeks post as foreman or site engineer London area.—Box 9661.

ELECTRICAL engineer (37), married, with extensive practical and theoretical experience coupled with sound administrative, commercial and organising ability, at present engaged as sales manager/buyer well-known export organisation, seeks progressive executive position, home or in Empire.—Box 9640.

ENGINEER (23), Grad.I.E.E., experience of generation and transmission, switchgear, rectifiers, H.P. boilers, turbines, etc.; apprenticeship, 2 yrs. in D.O. preparing schemes and estimates, seeks interesting post Southern Counties.—Box 9663.

ENGINEER, 36 years' varied experience all aspects contracting, desires appointment London or South. Buying, costing, accounts, estimations, administrative position.—Box 9632.

EXECUTIVE 25 years' commercial experience electric cable industry contemplates change provided position carries responsibility. C.M.A. also non-association sales and estimating (home and export), purchasing, works progress and transport experience, mainly paper cables. Excellent personal connections.—Box 9658.

H.F. induction heating applications engineer seeks position of responsibility, home or abroad. Age 28. H.N.C. in elec. eng. Experience well-known firm employing H.F. technique to production methods.—Box 9627.

LAMP foreman desires similar post; 15 yrs.' exp., working knowledge many types, development exp., educated to H. Nat. standard. Appreciate help with accommodation.—Box 9642.

WORKS electrical engineer seeks post as technical sales representative, own car.—Box 9655.

YOUNG electrician (22), 6 yrs.' technical and practical training, preparing for H.N.C., seeks progressive junior post.—48, Spencer Rd., London, S.E.24. 9612

YOUNG engineer, 29, Grad.I.E.E., with good practical training, seeks position in London area. Experience in production planning and works management. Please write—Box 9624.

## AUCTION NOTICES

**G. R.**

BY ORDER OF THE MINISTER OF WORKS

MINISTRY OF WORKS SURPLUS MATERIALS DEPOT, PIXASH LANE, KEYNSHAM, SOMT. (7 miles from Bristol, 5 miles from Bath, on the main Bristol-Bath Bus Route No. 33).

Important Sale by Auction of
**OFFICE FURNITURE, CANTEEN AND HOSTEL EQUIPMENT**

including Blankets, Bedding, Folding Iron Bedsteads, Hanging Wardrobes, Deal Racking, Folding and Standard Chairs, Filing Cabinets, Typist Desks, Trestle Tables, "Buttapatta" Machine, Fire Extinguishers, ELECTRIC FIRES, SHADES AND FITTINGS, 15-GALL. ELECTRIC BOILER, "CREDA" ELECTRIC HOT FOOD CUPBOARDS, "JACKSON" ELECTRIC COOKER, "BELLING" ELECTRIC GRILLER and a 2-DECK OVEN, Canteen Utensils, and numerous useful effects, which

**LALONDE BROS. AND PARHAM**

will sell by auction at the Depot as above on MONDAY and TUESDAY, 16th and 17th April, 1951, commencing at 11 a.m. each day.

On view Thursday and Friday, 12th and 13th April, 1951, 10 a.m. to 4 p.m.

Catalogues, price 6d., of the Auctioneers, 64, Queens Road, Bristol 8 (Tel. 21331) and 18, Boulevard, Weston-super-Mare (Tel. 4500). 998

**G. R.**

BY ORDER OF THE MINISTER OF WORKS

SURPLUS DEPOT, FEARNHEAD LANE, PADGATE. Near WARRINGTON

**CHARLES TAYLOR & SONS**

will Sell by Auction at the Depot above on WEDNESDAY, THURSDAY and FRIDAY, 18TH, 19TH and 20TH APRIL, commencing at 11.30 p.m. each day:
**SURPLUS STORES AND MATERIALS**

comprising Hardware, Ironmongery, Plumbers' and Drainsman's Sundries, Builders' Hand Tools, ELECTRICAL COMPONENTS, ELECTRIC MOTORS and CABLE, Steel and Copper Piping and Cisterns, Pumps, Radiators, Combustion Stoves, Heavy Duty Vertical Boilers, Wooden Doors, Canteen Equipment, including Refrigerators, small quantity of Paint and many miscellaneous stores.

On view Monday and Tuesday, 16th and 17th April, from 10 a.m. to 4 p.m. each day.

Admission by catalogue only (price 6d.), from the Auctioneers, 28, Queen Street, Albert Square, Manchester (Tel. Blackfriars 4418). 1027

## FOR SALE

### ELECTRIC MOTORS, 400/440/3/50

225-h.p. Internal S/R Motor by A.S.E.A., type M.22, open protected frame, 2 endshield oil bearings. Mounted on C.I. bedplate, shaft fitted pulley 28 in. diam. × 28 in. face, for flat belt drive. Rotor volts 482, rotor amps. 208. Speed 485 r.p.m. Complete with control gear.

170-h.p. Compensated Induction Motor by E.E.C. (suitable for power factor correction), size AGS.C16, protected type frame with endshield b/r bearings. Standard shaft extension fitted vee-rope pulley. Commutator machine with ext. sliprings. Speed 720 r.p.m. With control gear.

86-h.p. S/R, HOLMES, speed 485 r.p.m., protected type. Rotor volts 250, rotor amps. 180.

Two 75-h.p. S/R Motors by L.D.C., screen protected type with endshield ball bearings. External T.E. cont. rated sliprings. Rotor volts 245/268, rotor amps. 142/129, speed 485 r.p.m.

**GEORGE COHEN, SONS & CO. LTD.**
**Wood Lane, London, W.12**
(Tel. Shepherds Bush 2070) and
**Stanningley, Nr. Leeds**
(Tel. Pudsey 2241). 976

### CABLE FOR SALE

T.R.S. TRAILING CABLES ex stock, including :—
SINGLE-CORE up to .15 sq. in. (189 amps.).
TWIN-CORE up to .06 sq. in. (82 amps.).
THREE-CORE up to .12 sq. in. (113 amps.).
FOUR-CORE up to .04 sq. in. (55 amps.).
3-CORE to 24-CORE up to 15 amps.
Lead TELEPHONE CABLE, 10/20 and 12/10 lb.
P.I.L.C./Served, 3-core, 7/064 in.
P.I.L.C. S.W.A./Served : 2-core, 7/036; 3-core, 19/083; 4-core, 7/044; 4-core, 7/064; 4-core, 19/052; 4-core, 19/064.
WELDING CABLES up to 800 amp.
SINGLE T.R.S., 19/083 in., 2,000 yds.
Radio, Automobile and other small wires and flexibles.
Tough Rubber, Lead-covered and P.V.C. Housewiring Cables.
FLAT-TWIN 1/044 up to 19/064.
TWIN with EARTH 1/044 up to 7/064.
ALL THE ABOVE and numerous other types IN STOCK.
All types supplied.
Send your enquiries to :
**THE CITY & CONTINENTAL TRADING CO.**
**32-34, Dock Street, London, E.1**
(Tel. : Royal 4492.) 1044

### EARTH—CONTINUITY

Use the
PORTAWAY EARTHING CONDUCTOR
with the
FULGRIP-PORTAWAY BONDING CLAMP
for the most efficient earthing system.
Send for new Leaflet to-day.
**PORTER ELECTRICAL PRODUCTS LTD.**
**Bramhope, Leeds.** 248

### FLUORESCENT SHELLS

5' troughs 14s. 9d. ; 5' battens from 7s. 6d., etc., etc. Fully tooled and in full production of most sheet metal work for electrical trade.

**COWLING AND HOLDSWORTH LTD.,**
**Romside Trading Estate, North Street, Romford 7282.** 220

### CABLE FOR SALE

PAPER-INSULATED, LEAD-COVERED & SERVED to .1.
V.I.R. Cable, 7/064-19/052-19/083.
T.R.S. Single-core, 7/036-19/064-61/103.
**J. S. RAMSBOTTOM & CO. LTD.**
**Bow Street, Keighley**
(Tel. 3776). 45

### PAPER-INSULATED LEAD-COVERED CABLE

0.04 4-core P.I.L.C.S.W.A. Cable.
0.04 4-core P.I.L.C. unarmoured Cable.
**BRITANNIA MANUFACTURING CO. LTD.**
**22-26, Britannia Walk, London, N.1.**
163

### HOUCHIN DIESELS

DESIGNED and built for hard, continuous work. Ideal as a standard power unit for factories, building works and a host of other uses—or as an emergency reserve unit. Compact, rugged, reliable and fully portable.

100 kVA. 8 power factor, 3 voltages available (110 220, 440), 3-phase, 4-wire, 50 cycles, 1,500 r.p.m., G.M.C diesel engine 6-71 series, 126 h.p., continuously rated A completely self-contained plant.

Price (ex works) £1,950.

Supplied in many other types and sizes. Specification available on request.

**HOUCHIN LTD.**
**Garford Street, London, E.14, England**
(Tel. East 4123, 5 lines; Cables, "Garfodia, London") 230

### NEWMAN

NEWMAN INDUSTRIES LIMITED are pleased to announce that they have been appointed Sole Selling Agents for the United Kingdom for FRANCO TOSI and SISMA Diesel Engines.

The following are available for early delivery :—
One 1,000-kW. 300-r.p.m. and two 600-kW. 375-r.p.m. engine-driven Alternator Sets.
Three 620-h.p., 375-r.p.m. Diesel Engines.
Full details on application to :

**NEWMAN INDUSTRIES LIMITED**
**Yate, Bristol**
(Phone : Chipping Sodbury 3311). 9646

A Babcock & Wilcox water-tube boiler will cut down your fuel costs; we can supply from stock. Two 40,000 lb. evap. 200 lb. w.p. Two 25,000 lb. evap. 250 lb. w.p. One 20,000 lb. evap. 175 lb. w.p. Two 16,000 lb. evap. 190 lb. w.p. Two 12,000 lb. evap. 200 lb. w.p. We install complete, including brickwork. — Burford, Taylor & Co. Ltd., Boiler Specialists, Commercial Street, Middlesbrough (Tel. Middlesbrough 2622). 32

A BARGAIN in electric motors can always be obtained from A. Cooksley & Co. Ltd., 21-25, Tabernacle St., London, E.C.2. Tel. Monarch 3357. Stocks at present comprise new squirrel cage motors, 1-25 h.p., also new and secondhand slipring motors, with starters, from 7½ b.h.p. to 30 b.h.p. 50

A QUANTITY of secondhand 3-h.p. motors, 710 r.p.m., 440 volts, 3-phase, 50 cycles, screen protected and fitted with ball bearings, arranged for direct starting. Makers, Veritys Ltd. One 20-h.p. motor, 720 r.p.m., 440 volts, 3-phase, 50 cycles, fitted with ball bearings and bedplate; also oil-immersed starter for this motor complete with ammeter, overload coils and no volt. Makers, L.D.M. & Crypto. Offers will be considered for the lot, or separate motors.—Atkins Brothers (Hinckley) Ltd., Bond St., Hinckley. 1050

ABSORPTION refrigerator units for 3 cu. ft. cabinets (220/230 v.), new, complete with heating element and thermostatic control, £15 each.—Electrical Products Co., 55, Long Lane, London, E.C.1. 9645

A.C. and D.C. house service meters, all sizes, quarterly and prepayment, reconditioned, guaranteed one yr. Repairs and recalibrations. — The Victa Electrical Co., 47, Battersea High St., S.W.11 (Tel. Battersea 0780). 138

A.C. and D.C. motors, all sizes, large stocks, fully guaranteed.—Milo Engineering Works, Milo Road, East Dulwich, S.E.22 (Forest Hill 2278-9). 102

A.C. and D.C. motors, generators, from stock.—Service Electric Co. Ltd., Honeypot Lane, Stanmore, Middx. (Edgware 8631-4). 91

A.C. and D.C. motors, new and re-conditioned, from stock. Diesel generators and compressor sets.—Springdale Eng. Co. Ltd., 40, Spring Street, London, W.2 (PAD. 9402). 9656

A.C. Metrovick B.T.H. motors, ¼ h.p., 200/250 v., 50 c., 1-ph., 1,425 r.p.m., new, £5 10s. 9d.; ½ h.p. £6 11s. 8d.; ¾ h.p. £8 16s. 10d.; 1 h.p., capacitor start, £14 15s. 8d.; 1 h.p. £17 9s. 5d.; discounts to trade; also 3-phase and D.C. Guaranteed repairs and rewinds.—Johnson Engineering, 319, Kennington Road, London, S.E.11 (Reliance 1412-3). 90

A.C. variable speed drive, new, L.S. & E., 6 h.p., 346/3/50, 4-wire, 1,400/720 r.p.m., Brookhirst control panel and P.B. box. Various D.C. motors. Send for list. —A. C. Dibley & Co. Ltd., 72, Granville Road, Cricklewood, N.W.2. 997

ALL types T.R.S. and V.I.R. cable in stock. Buy now while obtainable. Send for price lists.—Northern Industries, Snow Hill, Manchester, 4. 135

ANODISING machines, 2,600 amps. and 800 amps., 60 volts, from stock. Also large stock of plating generators.—Fyfe, Wilson & Co. Ltd., Bishop's Stortford. 1022

ALTERNATORS, 31.3; 26 and 15 kVA, 400/3/50, 1,000 r.p.m.; also 1,500 r.p.m.—Box 9641.

B.A. stainless steel screws and nuts, ex stock.—Premier Screw & Repetition Co. Ltd., Woodgate, Leicester (Phone 5695). 148

BATTERY chargers, 4 models, 2-6-12 v., 1-2-4 amps., D.C., any mains voltage; also larger types, special transformers, chokes, test gear, interior car heaters, etc.—The Banner Electric Co. Ltd., Hoddesdon, Herts. 97

BRASS "½" lampholders, cordgrip lampholders, brass battenholders and all bakelite electrical accessories for disposal.—Alexander Jager Trading Company Limited (Primrose 8778). 9629

B.T.H. 1-h.p., 220/240-volt D.C., 2,850-r.p.m. motor. Price £13 10s.—Universal Electrical Co, 221, City Road, London, E.C.1. 947

DIESEL electric plants, from 3-20-kVA output, with remote push-button control and automatic voltage control; prompt delivery; 3-kVA pattern with Petter engine, £195.—Ward, Lordscroft Works, Haverhill, Suffolk (Tel. 253). 167

DIESEL generating sets, brand new and fully guaranteed, Lister 3.5 kW to 9 kW, A.C. and D.C.—Alliance Electrical Co. Ltd., 2, Henrietta St., London, W.C.2. 854

DIESEL generating sets, English manufacture, direct current, all voltages, from 50 kW to 260 kW.—Britannia Manufacturing Co. Ltd., 22-26, Britannia Walk, London, N.1. 158

DIESEL generating sets, English manufacture, 3-phase, all sizes from 50 kW to 260 kW.—Britannia Manufacturing Co. Ltd., 22-26, Britannia Walk, London, N.1. 157

DISTRIBUTION boards. 100-amp., 6-way, T.P. H.R.C. English Electric, 3 available. 120-amp., 6-way, T.P. & N., 4 available.—Boyce, Weir & Co., 778, New Hey Road, Huddersfield. 1045

ELECTRIC motors, dynamos, alternators and motor generator sets of all sizes. We hold one of the largest stocks in England. New and reconditioned with 12 months' guarantee.—Britannia Manufacturing Co. Ltd., Britannia Walk, London, N.1 (Clerkenwell 5512, 3 lines); also Works and Stores, Chobham, Surrey. 13

ELECTRIC motors, generators, control gear, transformers, A.C. and D.C., new and reconditioned; all covered with our usual 12 months' guarantee; large stocks available.—Electropower Co. Ltd., Kingsbury Works, Kingsbury Rd., London, N.W.10 (Colindale 4621-2). 42

ELECTRIC motors, generators, motor generator sets, transformers, switchgear, etc., large comprehensive stock, overhauled and guaranteed. Copy of our Register, "Electrical Surplus," containing thousands of items of electrical plant, sent on request.—R. F. Winder Ltd., Belgrave Electrical Works, Leeds, 2. 34

ELECTRODE steam boiler, G.W.B. Autolec, 150 kW, 550 lbs. per hour. Seen working.—J. E. Lewis & Sons, 6, Queens Road, Southend-on-Sea, Essex. 1052

EX W.D. rotary converters, 12 and 24 volts D.C. input, 230 volts A.C. output, 85 w., complete with choke, condenser and leak transformer, in metal cases 6 lbs. each, carr. paid.—Philpott, Fountain Sq., Fenton, Stoke-on-Trent. 9659

FLUORESCENTS. An illustrated 24-page catalogue of many models in twin and single 2-5 ft. units, decorative circular units, components, etc., all at extremely low prices, will be available during March. Contractors not on our mailing list are invited to apply now for a copy. A 24-hour repair service is now available for any make of fluorescent unit.—Lumitron Ltd., 53, Goodge Street, London, W.1 (Mus. 5385). 9556

FOR sale: Cable, 6,600 v., 3-core, .075 P.I.L.C.S.W.A., two lengths, 75 yards, 6 yards; circuit breaker, Ellison, 400 v., 150 kVA, oil-filled. Apply—Thomas De La Rue & Company Ltd., Portobello Works, Warwick. 949

FOR sale, 1,000-kW generator, 440 v. D.C., 580/600 r.p.m., 3-wire. Also 550 kW, 220 v. D.C., 300/480 r.p.m.—Fyfe, Wilson & Co. Ltd., Bishop's Stortford. 1025

FOR sale, 1,200 Paxolin tubes, Q grade, 34½" long, 3-1/16" i.d. by 3¾" o.d.—Box 1024.

FRACTIONAL h.p. Motors, new, ex-stock, A.C./D.C., Universal, B.T.H., Delco-Remy, G.E.C., Fracmo Newman Scophony.—Jeary Electrical Co. Ltd., 5, Lamb's Buildings, E.C.1 38

GENERATING sets. Our new Powerco diesel sets. 3 kVA, 230 v./1/50 A.C., complete, self-contained, early delivery, £210; other types, 1-50 kW A.C. and D.C., from £59; separate generators, alternators, 1-30 kW, £15 up; lists free.—Powerco, Wandsworth Town Station, York Road, London, S.W.18. 153

GENERATING Sets, petrol engine-driven alternators, 220/240 volts, single-phase and 3-phase.—Britannia Manufacturing Co. Ltd., 22-26, Britannia Walk, London, N.1. 160

GENERATING Sets, petrol engine-driven dynamos, 110 volts and 220-240 volts, direct current.—Britannia Manufacturing Co. Ltd., 22-26 Britannia Walk, London, N.1. 159

GEARED motors. Final speed 175 r.p.m., 230 volts, single-phase, 40 available.—Boyce, Weir & Co., 778, New Hey Road, Huddersfield. 1046

GENERATING sets, petrol, 5 to 15 kVA, single-phase, 50 periods, 230 volts.—Midland Counties Elec. Eng. Co. Ltd., Grice Street, West Bromwich. 43

HI-cycle generating set consisting of motor starter, frequency booster and 13 portable grinders and polishers.—Box 948.

HOUSE service meters, C. & H., Aron, E.A.C., 20-240 v. A.C., s.-ph., 50 c., 2½ amps., 7s. 6d. each. 1s. 6d. postage; 5 amps., 17s. 6d.—Universal Electrical, 217-221, City Road, London, E.C.1. 129

INSTRUMENT wires for sale, 36 s.w.g. enam., -19, 20 28, d.c.c., -22 Lewmex, -30, 31, 24 paper on enam.—Champion, 43, Uplands Way, London, N.21 (LAB. 4457). 1051

MERCURY are rectifier, E.C.C., 415-volt, 3-phase input, 500-volt D.C., 30-kW output, c/w ammeter, voltmeter and kWh meter, including oil circuit breaker and E.C.C. transformer. Can be inspected on site, as new.—Box 766.

MERCURY switches are made by Hall, Drysdale & Co. Ltd., of 58, Commerce Road, Wood Green, London, N.22 (Tel. Bow 7221). 182

METERS, A.C. or D.C., quarterly or slot, guaranteed, sent on approval if desired.—Brent Electrical Co., 6, Holmdale Gardens, London, N.W.4. 131

MOTOR converters and motor generators, unused, 110 v. and 220 v. D.C. to 250/1/50, 1 kVA, £29; 4 kVA, £49; 6 kW, £65; 110 v. and 220 v. D.C. to 25/35 v. D.C.; 1 kW, £19; lists free.—Powerco, Wandsworth Town Station, York Road, London, S.W.18 (Van. 5234). 149

MOTOR generator sets and converters, all sizes and voltages from ½ kW up to 500 kW in stock.—Britannia Manufacturing Co. Ltd., 22-26, Britannia Walk, City Rd., London, N.1 (Tel. Clerkenwell 5512, 5513 and 5514). 28

NAMEPLATES, engraving, diesinking, stencils.—Stilwell & Sons Ltd., 153, Far Gosford St., Coventry. 14

NEW 15-amp. D.P. skeleton switches, over 5,000 to clear.—Box 1049.

NICKEL-chrome spirals, 80/20 only, and kettle elements. Enquiries are invited by well-known manufacturers from users of large quantities.—Box 902.

NICKEL chrome tape, 2-lb. spools (.025" × .008" and similar sizes), about £250 worth, for sale at current Wiggins prices.—Precision-Electric Ltd., 21-23, St. Paul's Square, Birmingham, 3. 950

NICKEL chrome 80/20, .032 × .004, .050 × .005, 29, 40, 42 and 43 s.w.g., ex stock.—W. N. Richardson & Co., 66, Ullswater Road, Davyhulme, Manchester. 9643

PETROL-electric generating plants (3), J.A.P. No. 5 single-cylinder engine. Direct coupled to alternator. Automatic voltage control. Output, 110 v., 50-cycles, 1.5 kVA. £80 each. Write—J. L. Strickland, 7, St. Mary's Grove, London, S.W.13. 1048

PHONE 98 Staines. Tangye 26-kW diesel set, 220 v. D.C.; Petter 20-kW oil set, 220 v. D.C.; 2.75-kW petrol sets, 130/3/50; steam sets, 18, 26, 34, 50 and 250 kW.—Harry H. Gardham & Co. Ltd., Staines. 60

PLATING Dynamos, new, 800 amps., 6 volts, 400 amps., 6 volts, with D.C. or A.C. motors or new petrol engines.—Britannia Manufacturing Co. Ltd., 22-26, Britannia Walk, London, N.1. 156

PLATING Dynamos, 1,600 amp., 10 volts, with D.C. or A.C. motors.—Britannia Manufacturing Co. Ltd., 22-26, Britannia Walk, London, N.1. 155

PREPAYMENT 1s. Slot House Service Meters.—Universal Electrical, 217-221, City Rd., London, E.C.1. 56

PURLEY chokes and ballasts. Our 80-w. tapped h.p.f. ballast with starter switch-holder incorporated is proving itself the most popular unit. Suitable for most fittings. 57s. 6d. each subject.—F. W. Blanshard Ltd. (Dept. ER), Purley, Surrey (Uplands 4818/9). 52

RIGHTWAY pulley drawers, suitable for pulleys, couplings and wheels up to 20in. dia. For details send to—Electric Machinery Co. M/cr. Ltd., Union St., Ancoats, Manchester. 85

ROTARY convertors in stock, all sizes, enquiries invited.—Universal Electrical, 221, City Road, London, E.C.1. 16

STAFF time checking and job casting time recorders (all makes) for quick cash sale. Exceptional condition.—Write Box 220, Smiths, 100, Fleet Street, London, E.C.4. 31

STARTERS, Slipring and D.C., hand-operated, all voltages up to 40 h.p., new. Short delivery. Also Push-Button and Star-Delta 380/440/3/50, ex-stock.—Electropower Co. Ltd. Kingsbury Works, Kingsbury Road, London, N.W.9. Colindale 4621-2. 95

TANGYE generator for sale, 220 volts D.C., 130 amps., with control panel. Driven by 34-b.h.p., single-cylinder horizontal diesel engine. Inspect at works in W. England.—F. J. Edwards Ltd., 359, Euston Road, London, N.W.1. 975

SUPERIOR-Type Builders' Ladders now in production, also Steps, Trestles and Extension Ladders.—Tel. Shaftesbury Ladders Ltd., 453, Katherine Road, E.7. Grangewood 3363-4. 15

TOTALLY enclosed motors, ¼ to 10 h.p., 400/440 v., 3-ph., 50 c., any speed in stock.—Universal Electrical, 217-221, City Road, London, E.C.1. 1047

TRANSFORMERS. Power type, 10-0-200/240 volts, input 3.4-0-3.4 kV at 1.2 amps., 3½ kW rating, in metal case, new, few only; double wound, 230/110 volts, 4.75 kVA; motor alternator, 220 volts D.C., input 110 volts A.C., 500 cycles, 1½ kW output.—L. Dixon Co., 214, Queenstown Road, Battersea, S.W.8. 210

TRANSFORMERS, unused, 230 v./115/1/50, 3 kVA, £15; 5 kVA, £19; 10 kVA, £29; 15 kVA, £39; 100 kVA, 400/200/3/50 A.C., oil-cooled, £135; lists free.—Powerco, Wandsworth Town Station, York Rd., London, S.W.18 (Van. 5234). 152

TRIPLE-pole, 30-amp., ironclad switchplugs, nine with fuses, 9 without, brand new, surplus to requirements. List price, less 12½%.—Works Engineer, The London Aluminium Co. Ltd., Westwood Road, Witton, Birmingham, 6. 9653

VARIOUS makes of brand new cable for sale: Lead, 1/044, 3/029, 7/029; T.R.S. 1/044, 3/029, 7/029 and with earth; V.I.R. 1/044, 3/029, 7/029, 7/064.—Jager Trading Company Limited, 13, Eton Garages, Eton Avenue, London, N.W.3 (Primrose 8778). 9639

WARD Leonard Motor Generator Sets, all sizes.—Britannia Manufacturing Co. Ltd., 22-26, Britannia Walk, London, N.1. Tel. Clerkenwell 5512. 10

WE have a quantity of 1,500-watt, 230-volt, G.E.S., gas-filled lamps for sale. All brand new. Offers to —Messrs. A. H. Leach & Co. Ltd., Photo Works, Brighouse, Yorkshire. 1053

WELDING Dynamos and Welding Sets for sale.—Britannia Manufacturing Co. Ltd., 22-26, Britannia Walk, London, N.1. 11

1 90-h.p. B.T.H. unity power factor motor, 400/3/50, 595 r.p.m., complete with oil-immersed rotor and stator starter and slide rails, vee-rope drive comprising 16" motor pulley, 78" shaft pulley, 6" × 1¼" Dawson vee rubber belts for approx. 7' 3" centres.—Sherwoods Paints Ltd., Barking, Essex. 996

5½-h.p. reconditioned Crompton Parkinson screen protected b.b. motor, 200 volts, 750/1,000 r.p.m.; complete with automatic variable speed starter and rails. Price £85. — A. C. Dibley & Co., 72, Granville Road, London, N.W.2. 879

10-kVA alternator sets. Ideal for country house, etc., 10 kVA, 230 v., 50 cycles. Complete wtih exciter, voltage regulators, switchboard, frequency meters, ammeters, and iron-clad switch fuses for output. Mounted on angle-iron stand and complete with vee belt pulley. Designed to run at 1,500 r.p.m., but being belt driven they can be driven by an engine of any speed; unused. Price £85 each. — E.P.E. Ltd., 42-46, Windmill Hill, Ruislip Manor, Middlesex. 19

12½-kVA, 400-v. 3-phase generator set, complete with exciter, voltage regulator and control panel, with instruments; direct driven by 4-cylinder Pelapone petrol-governed engine. Can be seen running, excellent condition, £275 ex works.—Trianco Limited, Imber Court, East Molesey (Tel. Emberbrook 3300). 822

20 tons Staloy transformer iron asbestos-covered copper wire, nickel chrome wire, spiral and mica elements, 3-core cable, rubber sheathed.—Box 9628.

30-kVA Cummins 115/230/1/50 mobile diesel generating plant, electric starting complete unit in weather-proof housing on 4-wheel pneumatic-tyred large trailer, very substantial unit, £695; lists 200 others.—Powerco, Wandsworth Town Station, York Rd., London, S.W.18 (Van. 5234). 150

35 Brook 1-h.p., 400/3/50 motors, 940 r.p.m., complete with Allen West push-button starters, type S.C.1 Unused stock, £12 each complete.—William R. Selwood, Chandler's Ford, Southampton. 691

60-kVA diesel alternator set, A.E.C., 400/3/50; quick delivery; cheap.—Box 951.

80 DISPERSIVE reflectors 16" dia. × 10¾" high. Complete with G.E.S. lampholders. In excellent condition.—The Silent Channel Co. Ltd., Huntingdon (Tel. 292). 9657

250 fluorescent light fittings, Metro-Vick, open-top type, complete with suspensions, 80-watt tubes, condition good.—Phone, Hendon 1930. 995

250-kW rotary converters (2), with transformers and switchgear, input 6,600 volts, 3-phase, 50 cycles, output 420/210 volts; also A.C. and D.C. motors, switchgear, generating sets, welders, etc. — Midland Counties Electrical Engineering Co. Ltd., Grice Street, Spon Lane, West Bromwich. 36

200,000 yards telephone twin wire, No. 14/.0076, packed in export cases of 1,000 yards. Box 897.

## ARTICLES WANTED

### CABLES, FLEXIBLES AND CONDUIT

PLEASE offer us your surplus stocks. All types required. We can inspect.—Box 246.

ALTERNATORS wanted in good condition, must be 1,000 r.p.m., 15 to 30 kVA, any voltage.—Box 9626.

DIESEL engines or diesel-driven generator sets, 100 kW up to 400 kW, slow speed preferred. — Britannia Manufacturing Co. Ltd., 22-26, Britannia Walk, London, N.1. 58

ELECTRICAL steel offcuts or coreplates required, small and large quantities taken, approx. .024" gauge, minimum width 3".—Box 818.

ENAMELLED copper wire, 25, 26, 30, 31, 32, 34 s.w.g.; brass rod, ⅛", 3/16", ¼", 5/16", ⅜", ½" diam. Offers of any small quantities of these welcomed. Urgently needed.—Cox-Walkers Ltd., Feetham, Darlington. 1054

ENAMELLED or rayon/silk copper wire required, 27-30 s.w.g.—Renas Eng. Co. Ltd., 107, Albert Road, London, S.E.25 (Tel. ADD. 6055). 859

KETTLE connectors, circular. Purchase of a complete set of tools for above also considered.—Box 903.

LOW-tension oil-immersed switchgear required, preferably Ellison or Crompton Parkinson, 100/1,000 amps., with busbars and floor mounting standards.—Box 857.

MERCURY (Quicksilver) wanted. Write for packing instructions. Gold, silver and platinum also purchased.—Collingridge & Co. Ltd., Riverside Works, Riverside Road, Watford. Tel. 5963. 20

NICKEL iron batteries, condition immaterial. Please quote maker, type number and quantity available.—G. W. George, The Oaks, Rettendon Common, Nr. Chelmsford, Essex (Hanningfield 200). 113

PLATINUM wanted in any shape or form. We pay £25-£30 per oz. for platinum points, contacts, wire, crucibles and scrap platinum.—M. Hayes & Sons Ltd., 106, Hatton Garden, London, E.C.1 (Hol. 8177). 731

RESISTANCE wire (nickel-chromium), any quantity bought for cash.—Box 125

RESISTANCE wire, nickelchrome. Offers of surplus stock, 20-30 gauge, invited.—Box 7433.

STEEL, aluminium, brass, sheets, strip, bars, off-cuts. Any quantity; immediate payment.—Grades Sheared Metal Co. Ltd., Green Lane, Hounslow, Middx. (Telephone, Feltham 3274). 699

SURPLUS laminations, copper wire, screws, etc. Good prices paid or can offer similar goods in exchange.—Box 9431

URGENT: 57½-kVA alternator by Alpha Harris required, 400/3/50 supply, 4-wire, 1,500 r.p.m., suitable for direct coupling. Full details location, price, etc., to—Box 999.

URGENTLY required, enamelled and textile covered copper wires; also flexes and cables. Copper sheets, brass sheets, aluminium sheets in all gauges, brass rods, rounds, Hex, A/F.—Industrial Suppliers (Cambridge) Ltd., 15a-17, Brecknock Road, N.7 (Gul. 5891/2/3). 797

WANTED, D.C. and A.C. ball-bearing motors, motor generator sets, dynamos and alternators. Full details to—Britannia Manufacturing Co. Ltd., 22/26, Britannia Walk, London, N.1. 29

WANTED for prompt cash, ferrous and non-ferrous scrap, also plant for dismantling. Buyers of second-hand machinery and plant for re-use.—W. & H. Cooper Ltd., 176, Brady Street, Bethnal Green, E.1. 24

WANTED, Isenthal voltage regulators. Faulty regulators acceptable. Any quantity. Good price offered and prompt payment.—Box 1020.

WANTED, Lewmex and similar covered wires, 23 to 30 s.w.g. — Quick Service, 121, Woodlands Road, Ilford, Essex. 9648

WANTED, Lister diesel set, 20 kVA, 230/3/50 output or 27.5 kVA, 400/3/50 output.—Box 1022.

WANTED: One 150/200-kW alternator, 400/3/50 cy., 4-wire, with exciter, suitable for direct coupling at 375 r.p.m. Alternatively, a complete Belliss & Morcom steam-driven alternator set would be considered, provided modern.—Box 9647.

WANTED, rotary converters, any size.—Universal, 221, City Road, London, E.C.1. 22

WANTED, scrap electric motors, dynamos and cable. Top prices paid. — H. Reed, 36, Bridge Street, Leatherhead, Surrey. 9545

WANTED, 100-kW, 400/440/3/50 alternators at 500 r.p.m.—Box 1021.

400, 500, 800 cycle alternators or motor generators wanted. All ratings and voltages. Quantities required. — Wilflo Products, 216/228, Gorbals Street, Glasgow, C.5. 952

## WORK WANTED AND OFFERED

### CASTINGS

**Fisher Foundries Ltd., Greet, Birmingham**

have capacity for brass, gunmetal and soft grey iron machine moulded repetition castings weighing 1-30 lb. loose pattern work up to 3 cwt.; delivery by road to all parts.

Tel. B'ham, Victoria 0197. 225

A.C. and D.C. Motor rewinds and repairs. Prompt service, fully guaranteed.—Edgware 8631 (4 lines): Service Electric Co. Ltd., Honeypot Lane, Stanmore, Middx. 92

ARMATURES. Vac. dryer and small electric tools rewound and returned in 7 days. Guaranteed service. —Streatham Transformer Co. Ltd., 68, Streatham High Road, London, S.W.16. Streatham 7626. 118

DO you want something made in quantity?. If it is a metal pressing or assembled component, we can offer you the factory space and manufacturing "know-how." Send us your enquiries.—Metal Components Ltd., Dolphin Road, Shoreham, Sussex. Tel. Shoreham 2224-5. 74

MECH. electr. engineers have facilities for developm. and design work up to the finished prototype or machine.—Box 9615.

MOTOR rewinds of all types. Heating elements and spirals of every description.—Elementa (Leicester) Winding Co., 307, St. Saviours Rd., Leicester. 203

## BUSINESSES FOR SALE AND WANTED

FOR sale: Fully equipped freehold factory of 2,900 sq. ft., established for over twenty years, for repairs to all electrical machinery; S.W. London area.—Box 971.

OWNERS of old-established businesses wishing to retire should consult Business Brokers Ltd., 46, St. James's Place, London, S.W.1 (Regent 4720); many buyers available, particularly for large propositions. 205

SURREY. Between Leatherhead and Guildford. Practically no competition for 6 miles radius. Radio, television and electrical business for sale. Excellent modern shop (centre of block), large workshop and cellar, central, etc.; numerous agencies, H.M.V., Ferranti, Cossor, Hoover, heating, etc.; rent £104 p.a.; lease 14 years unexpired, £1,500, s.a.v. Sole agents:— Wills & Smerdon F.A.L.P.A., 6, Station Road, East Horsley, Surrey (Tel. 3333, 3 lines). 1055

## AGENCIES

AGENCIES required by long-established firm of manufacturers' agents with large sales organisation covering the whole of Great Britain for conduit, conduit fittings, cables and flexibles, fans or any lines suitable for distribution to wholesalers; commission or buying basis.—Box 64.

AGENTS required, calling wholesalers, etc., to carry high quality line domestic appliances, 5% commission basis. Agreed territories.—Box 749.

HEATING pads and blankets made by competitive German firm specialised in this field for 25 years. Agents selling to wholesalers, the B.E.A. or other large organisations are invited to write with confidence for details, giving territory covered. Other domestic appliances produced by German firms will shortly be available. —Box 901.

SALES agent required on commission basis having a sound connection with electricity supply authorities, borough and town councils in Hants and Surrey.—Box 972.

"WELCOLITE." Agents wanted for our lighting sets. Diesel and petrol-engine driven, all voltages, alternating current. Automatic operation, also hand starting.—Welland Engineering Co. Ltd., Water Lane, Spalding. 953

## CONSULTANTS

HIGH-tension and power transformer engineering specialist, expert on saturable reactors, magnetic amplifiers, many years' practical experience, high academic qualifications, consultant of large firms, offers competent advice on projects, development, design and manufacture. —Box 9652.

## EDUCATIONAL NOTICES

CITY & GUILDS (Electrical, etc.) on "No Pass—No Fee" terms. Over 95% successes. For full details of modern courses in all branches of Electrical Technology send for our 176-page handbook. Free and post free.—B.I.E.T. (Dept. 12A), 17, Stratford Place, London, W.1. 200

# COMPANY MEETING

*Copy can be accepted up to first post on Monday for publication on the following Friday.*

Price £18 per column and pro rata.

### ERICSSON TELEPHONES

**New Records**

THE Forty-eighth Ordinary General Meeting of Ericsson Telephones Ltd. was held on 30th March in London. Sir Harold A. Wernher, G.C.V.O., chairman of the company, presiding.

The chairman, in the course of his speech, said: When I addressed you at the last general meeting I concluded with these words, "We have every reason to look to the immediate future with confidence." Now that you have seen the accounts I think you will agree that my confidence was fully justified. For the third year running, and in the face of many difficulties, new records have been established, both for output and profit.

Once again a very large proportion of our sales has been to overseas customers. The painstaking work of the past 50 years in building up a reputation for quality products is reaping its reward.

At home, too, we know that there are approaching 450,000 applicants awaiting telephone service, and with very little sales effort this number could be increased considerably. There are, in addition, 300,000 subscribers who share a line; there can be little doubt that most of these would prefer full service if lines were available. On several occasions I have drawn attention to the inadequacy of the Government's building programme for housing public exchanges. This is causing disquiet in the telephone industry because the position seems to deteriorate. It is obvious that a higher building priority will have to be given to Post Office buildings.

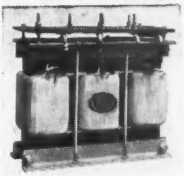
The gross profit, after providing for depreciation of fixed assets and other items, amounted to £1,188,223, compared with £1,051,071 for 1949. Taxation takes £655,609, or nearly 56%; this load, together with purchase tax, National Insurance contributions, etc., bears very heavily on industry.

Export business has become more competitive and there may be some recession in the profits in the immediate future. There will also be shortages of raw materials which will hinder our production, but our technical departments will relieve the situation by the use of substitutes. Despite these difficulties, there is already sufficient evidence to justify me in saying that we should be able to meet you again next year with another satisfactory report.

The report was adopted, and a final dividend of 12% and a bonus of 5%, both free of income tax, on the Ordinary stock was approved. 1028

CLASSIFIED ADVERTISEMENTS
ARE PREPAID


**POWER Transformers**

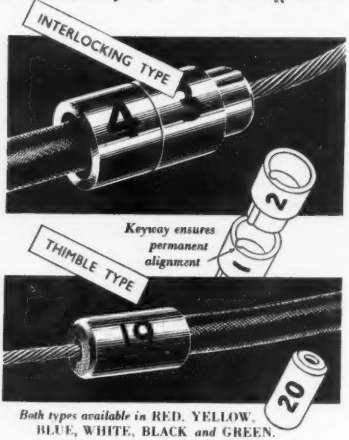


10 VA to 100 kVA Open, Enclosed, Oil Cooled, D.W. & Auto

For L.V. Lighting & Power, Furnaces, Electronics, Phase Conversion, etc.

**THE TRANSFORMER & ELECTRICAL CO. LTD**
Eastern Works, Walthamstow, London, E.17
*Phone: KEYstone 5031/2*

## *Cable End* FERRULES

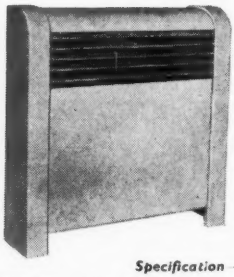



*Both types available in* RED, YELLOW, BLUE, WHITE, BLACK *and* GREEN.
*Samples and prices on request*

**CRITCHLEY BROS LTD**
BRIMSCOMBE · STROUD · GLOS
*Telephone Brimscombe 2208/9*

## *Thermalair* HEATING and VENTILATING EQUIPMENTS

**CONVECTORS**



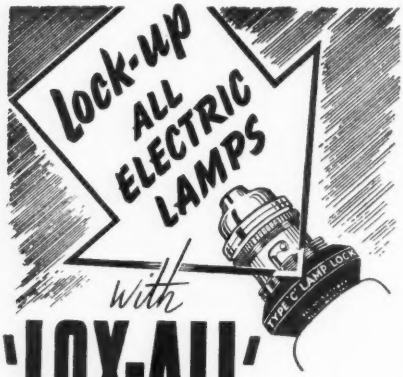
ROBUST CONSTRUCTION
ACCESSIBLE FOR SERVICE
EASY TO INSTAL
ECONOMICAL
ILLUMINATED

***Specification*** –
**Case:** Heavy Gauge Sheet Steel.
**Elements:** High-grade Nickel Chrome. Black Heat. Easily replaceable.
**Finish:** Green Stove Enamel with Copper Louvres.

**H.V.E. (ELECTRIC) LTD.**
Russell Chambers, 54 Merrion Street
LEEDS *Phone 25821*

HVE UNIT HEATING

## *Lock-up ALL ELECTRIC LAMPS with* 'LOX-ALL' ELECTRIC LAMP LOCKS




Suitable for brass or bakelite bayonet fittings
***Obtainable from all leading Wholesalers***
Full details gladly supplied by
**CHECKLOX, 169 Piccadilly, London, W.1**
*Phone: REGent 1900*

## *Keeps out burglars brings in business!*

- ★ **Combined safety-chain and burglar-alarm.**
- ★ **Sounds the alarm and keeps them out when lock is forced.**
- ★ **Easy to fit to doors and windows.**
- ★ **Can be connected to door-bell circuit.**

ELECTRIC **bobby** | List Price **12/6**

*Full trade details from:*
**JEARY ELECTRICAL CO. LTD.**
**12 ERROL STREET, BUNHILL ROW, E.C.1**

# COMPRESSION TYPE CABLE GLAND

*for*

V.I.R.S.W.A.S. LEAD AND ALUMINIUM CABLES

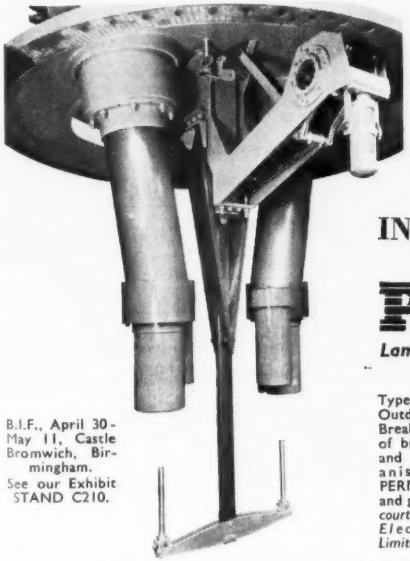
A cable can be prepared and installed in a matter of minutes. All parts are interchangeable.

*Write for descriptive leaflet*

**H. DUNNING & CO. (1946) LTD.**

Stamford Works, Stamford Rd., Audenshaw, nr. Manchester

*Telephone : DENton 2828*



*where*

**STRENGTH**

*is vital . . .*

**INSULATE WITH**

# PERMALI

***Laminated . Impregnated . Densified***

B.I.F., April 30 - May 11, Castle Bromwich, Birmingham. See our Exhibit STAND C210.

Type O.D.10. 132 kV. Outdoor Oil Circuit Breaker. Detail view of breaker contacts and tripping mechanism showing PERMALI lifting rods and guides. *Photo by courtesy of The General Electric Company Limited.*

PERMALI LTD. (Formerly The New Insulation Co. Ltd.), GLOUCESTER . Tel. 24941 . Grams : "NICO, GLOUCESTER"
17586C

INDEX TO ADVERTISERS


Abbot, Brown & Sons Ltd. ..... 132
Acru Electric Tool Manufacturing Co. Ltd. ..... 60
Adcola Products ..... 26
Airscrew Company & Jicwood Ltd. ..... 124
Allen, Edgar, & Co. Limited ..... 101
Armorduct Cable Co. Ltd. ..... 142
Asdowas Limited ..... 111
Atelier de Constructions Electriques de Charleroi ..... 14
Automatic Light Controlling Co. Ltd. ..... 22
Axon Motor Re-Winding Co. Ltd. ..... 16

Babcock & Wilcox Ltd. ..... 66
Bakelite Limited ..... 120
Baldwin, H. J., & Co. Ltd. ..... 120
Barrow-Whitney Ltd. ..... 106
Barries Electrical Agencies Limited ..... 130
Bate, William, Limited ..... 44
Benjamin Electric Ltd. ..... 27
Berry's Electric Ltd. ..... 68
Birkby's Ltd. ..... 51
Birmingham Sound Reproducers Limited ..... 107
Braw Knox Limited ..... 35
B.M.B. (Sales) Ltd. ..... 42
Bowker, S. O., Ltd. ..... 2
Bowthorpe Electric Co. Ltd. ..... 96
Britannia Batteries Limited ..... 105
British Aluminium Co. Ltd. ..... 1
British Industries Fair ..... 140
British Insulated Callender's Cables Limited ..... 13 & 108
Brook Motors Ltd. ..... 91
Brookhirst Switchgear Limited ..... 128
Bulpitt & Sons Ltd. ..... 138
Burco Ltd. ..... 109
Burgess Products Co. Ltd. ..... 12

Canning, W., & Co. Ltd. ..... 112
Cayson Electrics Ltd. ..... 55
Central Manfg. & Trading Co. (Dudley) Ltd. ..... 120
Channel Conduits (1949) Ltd. ..... 99
Checklox ..... 88
Churchouse, C. M., Ltd. ..... 139
City Electrical Co. ..... 36
Clang Limited ..... 90
C.M.I. Products Ltd. ..... 60
Collins Electrical Ltd. ..... 118
Contactum Ltd. ..... 31
Cooper & Co. (B'ham) Ltd. ..... 106
Copperad Ltd. ..... 56
Coughtrie, J. & G., Ltd. ..... 117
Cox-Walkers Ltd. ..... 50
Cressall Manufacturing Co. Ltd. ..... 120
Critchley Bros. Ltd. ..... 88
Crofts (Engineers) Ltd. ..... 39
Crompton Parkinson Limited ..... Cover ii
Croydon Engineering Co. Ltd. ..... 110
Cryselco Ltd. ..... 6

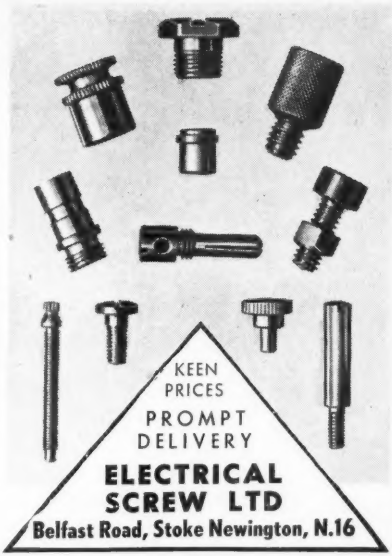
Day, J., & Co. (Derby Works) Ltd. ..... 60
Deco Engineering Co. Ltd. ..... 132
Desoutter Bros. Ltd. ..... 19
Donovan Electrical Co. Ltd. ..... 36
Downes & Davies Ltd. ..... 103
Dubilier Condenser Co. (1925) Ltd. ..... 30
Dunning, H., & Co. (1946) Ltd. ..... 89

East London Mica Works ..... 130
Edge, Arthur, & Co. Ltd. ..... 31
Edison Swan Electric Co. Ltd. ..... Cover i
Ega Electric Ltd. ..... 69
Electra Sales (Essex) Ltd. ..... 119
Electric Construction Co. Ltd. ..... 10
Electric Depot Ltd. ..... 55
Electric Elements Co. ..... 92
Electrical Contractors Association (Inc.) ..... 111
Electrical Remote Control Co. Ltd. ..... 90
Electrical Screw Ltd. ..... 90
Electricity Services Ltd. ..... 132
Electro Dynamic Construction Company Limited ..... 121
Ellison, George, Limited ..... 65
EMP Electric Ltd. ..... 93
Enfield Cables Limited ..... 37
English Electric Company Limited ..... 5 & 109
Ericsson Telephones Limited (Company Meeting) ..... 87

Falk, Stadelmann & Co. Ltd. ..... 53
Ferguson Pailin Ltd. ..... 61
Ferranti Ltd. ..... 11
Fibreglass Limited ..... 94
Fluorescent Lighting Equipment Co. Ltd. ..... 56
Foire de Internationale Liege ..... 100
Foster Transformers & Switchgear Ltd. ..... 9

General Cable Manufacturing Co. Ltd. ..... Cover iv
General Electric Co. Ltd. ..... 72 & 125
G.M. Engineering (Ottery St. Mary) Ltd. ..... 64
Grelco Ltd. ..... 132
Grove, John, & Son (Birmingham) Ltd. ..... 91


(*Continued on page 92*)


**ELECTRICAL REMOTE CONTROL CO. LTD.** *Phone: LAR. 5435*

PROMPT DELIVERIES of Timers, Relays and other electrical control instruments

**13/15 EVANSTON AV., LONDON, E.4**

*Well ahead of the rest!*

**CLANG ELECTRICAL ACCESSORIES**

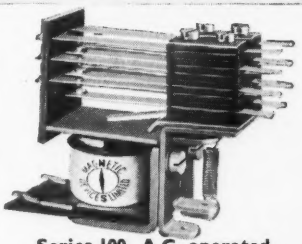
**CLANG**

**LIMITED**

**Crown Yard, CRICKLEWOOD, N.W.2**

**Tel. : GLADSTONE 4201**

# RELAYS



**Series 100. A.C. operated**
**Series 105. D.C. operated**

Compact and Reliable.
Silent on A.C.: 25 to 60 cycle.
One- to Six-Pole Contacts.

*Enquiries for all types of relays to:*

## MAGNETIC DEVICES LIMITED

*Ditton Works · Cambridge*

Phone: TEVERSHAM 311

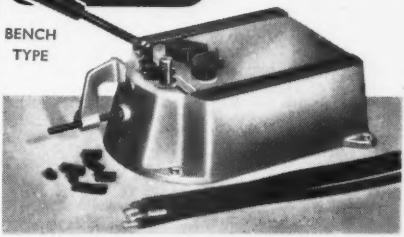
## FASTER CABLE STRIPPING with ACCURACY.

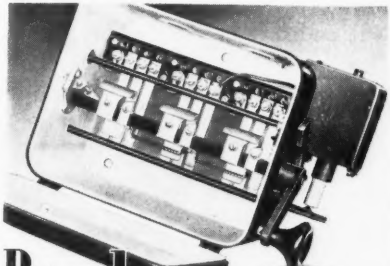
Designed for production work, the Hyde Cable Stripper is easily secured to bench or work table, and requires no skill to operate. In one quick operation it strips rubber insulation, asbestos or plastic from cables up to ¾" dia. without scarring or nicking the conductors. It can also be used for flat twin or other types of cable. Send for illustrated leaflet giving full details.

**HYDE CABLE STRIPPER**

**J. B. HYDE**
AND CO. LIMITED
Wythenshawe
Manchester

BENCH TYPE





# Brook

**STAR-DELTA SWITCH STARTER**

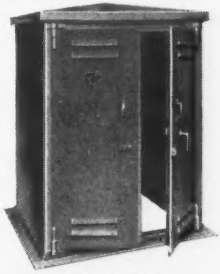
**T15**

Brook hand operated starter for cage induction motors on three phase circuits, giving two step starting by connecting windings first in star and finally in delta.

BROOK MOTORS Ltd. HUDDERSFIELD · ENGLAND
Makers of A.C. Electric Motors from 0·25 to 200 h.p.

## JOHN GROVE & SON
**(BIRMINGHAM) LTD.**
**Ernest Street, BIRMINGHAM 1**

*Telephone : MID. 0815*



*Specialists in all types*

**SHEET METAL SWITCHGEAR HOUSINGS, CUBICLES, FUSEBOARD CASES, BUSBAR CHAMBERS, SWITCH BOARDS, ELECTRIC STARTER CASES, ETC.**

***Strongly constructed to Customer's own Specification***

INDEX TO ADVERTISERS

(Continued from page 90)


Hackbridge Cable Company Ltd. ..... 32
Hannover Trade Fair ..... 48
Hawkins, L. G., & Co. Ltd. ..... 62
Hedin Ltd. ..... 112
Hendrey Relays Ltd. ..... 95
Henley's, W. T., Telegraph Works Co. Ltd. ..... 126
Higgs Motors Ltd. ..... 21
Hildick & Hildick ..... 22
Holophane Ltd. ..... 41
Hunt, A. H., Ltd. ..... 104
H.V.E. (Electric) Ltd. ..... 88
Hyde, J. B., and Co. Limited ..... 91

Inductive Appliances Ltd. ..... 20
Ismay Lamps Ltd. ..... 127

Jeary Electrical Co. Ltd. ..... 88
Johnson & Phillips Ltd. ..... 59 & 133

Kaye, E. & E., Ltd. ..... 42
Klaxon Ltd. ..... 124

Lancashire Dynamo and Crypto ..... 129
Litholite Insulators & St. Albans Mouldings Ltd. ... 40
Londex Ltd. ..... 116
London Transformer Products Ltd. ..... 134
Long & Crawford Ltd. ..... 34

Magnetic Devices Limited ..... 91
Manganese Bronze & Brass Co. Ltd. ..... 58
Marine Engineering Co. (Stockport) Ltd. ..... 93
Martindale Electric Co. Ltd. ..... 69
Mather & Platt Ltd. ..... 36
McClure, David, Ltd. ..... 119
McKechnie Brothers Ltd. ..... 50
Mek-Elek Engineering Ltd. ..... 142
Meritus (Barnet) Ltd. ..... 132
Metafiltration Company Limited ..... 135
Metallic Seamless Tube Co. Ltd. ..... 38
Metropolitan-Vickers Electrical Co. Ltd. ..... 70
Metway Electrical Industries Ltd. ..... 33
Midland Electric Manufacturing Co. Ltd. ..... 4
Monks & Crane Ltd. ..... 45
Morecambe Electrical Equipment Co. Ltd. ..... 100
Morris, John, Electrical Engineering Co. Ltd. ..... 92

Newalls Insulation Co. Ltd. ..... 136
Newton Brothers (Derby) Ltd. ..... 136
Normand Electrical Company Limited ..... 123

Oliver Pell Control Ltd. ..... 20

Parmiter, Hope & Sugden Ltd. ..... 97
Parnall (Yate) Limited ..... 17
Partridge Wilson & Co. Ltd. ..... 96
Permali Ltd. ..... 89
Permutit Company Ltd. ..... 43
Poles Ltd. ..... 55
Power Jacks Limited ..... 63
Pritchett & Gold and EPS Co. Ltd. ..... 71
Pultra Ltd. ..... 25

R.C. Radio-Electric Ltd. ..... 127
Reyrolle, A., & Co. Ltd. ..... 28
Rists Wires & Cables Ltd. ..... 18
Rivlectric Lamp Works ..... 16
Robinson, Lionel, & Co. Ltd. ..... 44
Rolls Switches Limited ..... 54
Rotherham & Sons Ltd. ..... 139
Rowlands Electrical Accessories Ltd. ..... 131
Rozalex Ltd. ..... 36
Runbaken Electrical Products ..... 142

Sanders, W., & Co. (Wednesbury) Ltd. ..... 26
Sangamo Weston Ltd. ..... 68
Savage Transformers Ltd. ..... 116
Saxon Components Ltd. ..... 112
Saxonia Electrical Wire Co. Ltd. ..... 22
Service Electric Co. Ltd. ..... 103
Siegrist Orel Ltd. ..... 120
Siemens Brothers & Co. Ltd. ..... 13
Siemens Electric Lamps and Supplies Limited ..... 3
Siemens-Schuckert (Great Britain) Limited ..... 15
Simmonds & Stokes Limited ..... 135
Simplex Electric Company Limited ..... 47
Sims, F. D., Limited ..... 98
Small Electric Motors Ltd. ..... 29
Smart & Brown (Eng.) Ltd. ..... 122
Smith, Frederick, & Company ..... 113
South Wales Switchgear Limited ..... 23
Southern Trade Services Ltd. ..... 60
Spiral Tube & Components Co. Ltd. ..... 55
Standard Telephones and Cables Limited ..... 52
Sterling Metals Ltd. ..... Cover iii
Sterling Varnish Co. Ltd. ..... 24
Stott, James, & Co. Ltd. ..... 32
Stream-Line Filters Ltd. ..... 25
Sturtevant Engineering Co. Ltd. ..... 7



JM JOHN MORRIS
ELECTRICAL ENGINEERING Co Ltd
BILSTON. TEL 41687. • STAFFS.

**SWITCHGEAR**

Dead front, Cubicle Type, Low Tension Switchgear, up to 1,000 amps rating at 660 volts

*Ask for special literature of this and other products*



**ELECTRICAL REVIEW**
**INSTRUCTION CHART**
FOR DEALING WITH APPARENT DEATH FROM
**ELECTRICAL SHOCK**
*(in accordance with H.O. Electricity Regulation 29)*
Printed on Sheet Aluminium and coated with weather-resisting varnish. 8/- each. Postage and Packing 1/-
*Other styles and prices on application to—*
ELECTRICAL REVIEW, Dorset House, Stamford St. LONDON, S.E.1 *Phone: WATerloo 3333*



Sutcliffe Speakman and Company Limited ..... 141
Synthetic Carbon & Eng. Co. Ltd. ..... 16

Taylor & Petters Ltd. ..... 142
Taylor Tunnicliff (Refractories) Ltd. ..... 137
Telephone Manufacturing Co. Ltd. ..... 141
Thew, Edward H., Ltd. ..... 26
T.M.C.-Harwell (Sales) Ltd. ..... 8
Transformer & Electrical Co. Ltd. ..... 87

United Ebonite & Lorival Ltd. ..... 46

Varley Magnet Company ..... 22
Vent-Axia Ltd. ..... 16
Vincent Switchgear Mfg. Co. Ltd. ..... 119
Viscose Development Co. Ltd. ..... 114

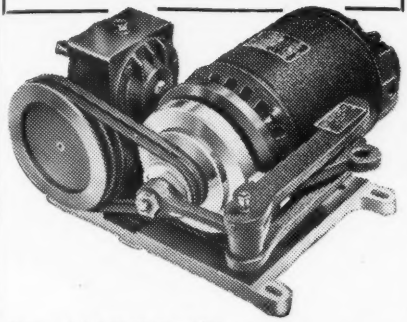
Wades (Metal Spinners) Ltd. ..... 112
Walter, D., & Co. Ltd. ..... 26
Walters, Austin & Son Ltd. ..... 95
Ward & Goldstone Ltd. ..... 115
Washers Ltd. ..... 142
Weir Electrical Instrument Co. Ltd. ..... 127
Weir, G. & J., Ltd. ..... 139
West Insulating Company Ltd. ..... 112
Westminster Eng. Co. Ltd. ..... 16
Wolf Electric Tools Ltd. ..... 57
Wootton & Co. Ltd. ..... 15

Zenith Electric Co. Ltd. ..... 119

THE

# MARDRIVE REG'D

## Clutch Worm Reduction Unit



The MARDRIVE clutch worm reduction unit is invaluable for low speed drives where it is necessary to start and stop instantly and at more frequent intervals than is possible by direct switching of the motor.

The unit has simple, adjustable belt tension between the unit and the driven member.

By the use of varying ratios of worm reducers a speed range of from 10 r.p.m. to 115 r.p.m. is readily attainable and with variations of the pulley sizes, this range can be further increased.

These fractional horse-power units are readily available for use on single-phase, three-phase or D.C. electrical supply.

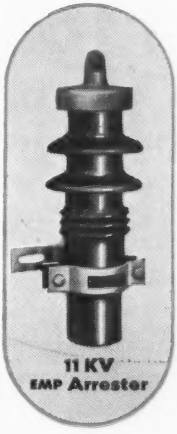
The unique qualities of the MARDRIVE clutch worm reduction unit make for elimination of fatigue and an increase in both quality and quantity of production.

The
MARINE ENGINEERING
CO. (STOCKPORT) LTD
Offices: BULKELEY STREET, EDGELEY, STOCKPORT
Works: CARLISLE STREET, EDGELEY, STOCKPORT
Phone: STOckport 2008/9 (Two lines)

EMP

*Lightning*
ARRESTERS

**HEAVY DUTY TYPE**
up to **66 KV**
*Surge Current Capacity—*
**65,000 Amps**
*and*
**EXTRA HEAVY DUTY TYPE**
up to **220 KV**
*Surge Current Capacity—*
**120,000 Amps**




**SPECIAL FEATURES**

- Tested with surge current tails up to 1,000 microsecs. ("hot" lightning).
- Residual Voltage characteristic turning flat with high surge currents.
- Low impulse ratio.
- Operation on D.C. traction circuits.

EMP ELECTRIC LTD.
GARMAN ROAD, TOTTENHAM, LONDON, N.17
Phone: Tottenham 6641 & 4255. Grams: "Arrester, London"

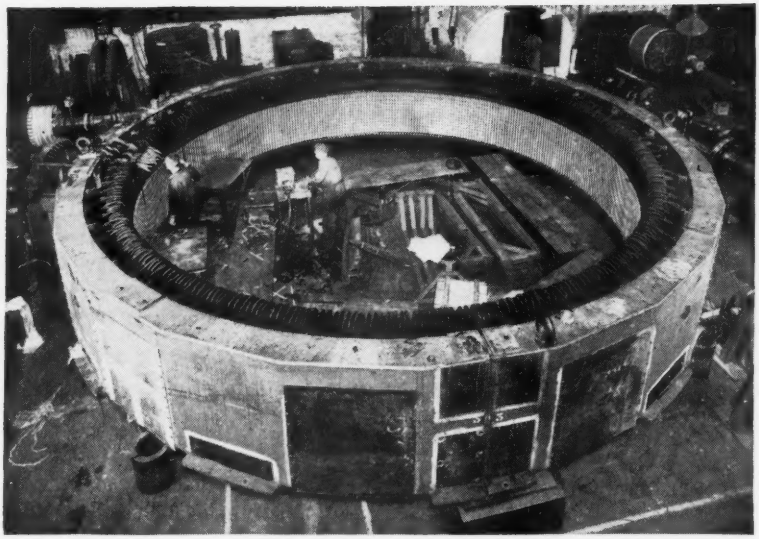


*Photo: Courtesy Metropolitan-Vickers Electrical Co. Ltd.*
*One of the three water-turbine driven generator stators — the largest so far built in this country — for a New Zealand power station. Each coil consists of a number of "Fibreglass" insulated copper strips in parallel.*

# FIBREGLASS

TRADE MARK

## — for Electrical Insulation
## Yarns, Tapes, Sleevings & Tying Cords

Experience has shown that substantial freedom from alkali is essential in glass textiles used for electrical insulation. " Fibreglass " yarn is substantially free from alkali and is **Electrical Insulation at its best.**

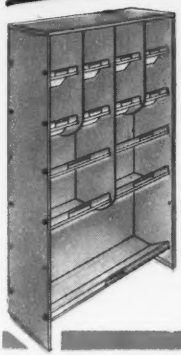
If insulation is destroyed, electrical equipment fails—valuable working hours are lost—important deliveries are delayed. The price of inferior insulation is a heavy one. Nothing but the best insulation available is good enough for your equipment. Since " Fibreglass " is made of glass, it is inorganic, acid resistant, and unaffected by corrosive fumes or heat—and since the glass is substantially free from alkali it is also unaffected by moisture.

**Fibreglass Limited, Ravenhead, St. Helens, Lancs. (St. Helens 4224)**

| LONDON OFFICE: | GLASGOW OFFICE: | NEWCASTLE-ON-TYNE OFFICE: |
|---|---|---|
| 63/65 Piccadilly, W.1 | 136 Renfield Street | c/o Pilkington Brothers Ltd., |
| (Regent 2115/6) | (Douglas 2687) | Westgate Road (Newcastle 20938) |

STEEL STORAGE EQUIPMENT

"Easirect"

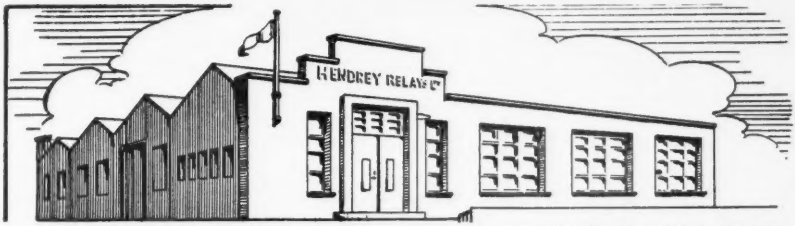


We Manufacture
all Types of Steel Storage Equipment

TOOL CABINETS
BINS AND SHELVING
STORAGE RACKS
WORK BENCHES
COMBINATION ASSEMBLIES
Buy and Rely on

PRODUCTS

AUSTIN WALTERS & SON LTD.
STORAGE AND EQUIPMENT DEPARTMENT
OLD TRAFFORD, MANCHESTER 16
TEL.: TRA. 1077-8 GRAMS.: OMNIA, MANCHESTER




ELECTRICAL ENGINEERS

CONTRACTORS TO THE PRINCIPAL ELECTRICITY UNDERTAKINGS

ON ADMIRALTY, MINISTRY OF SUPPLY AND POST OFFICE LISTS

A.I.D. APPROVED

RELAYS FOR ALL PURPOSES
STANDARD—TIME DELAY
OVERLOAD—EARTH LEAKAGE

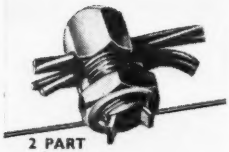
MERCURY SWITCH CONTACTORS

LABORATORY APPARATUS

CONTROL EQUIPMENT TO CUSTOMERS' REQUIREMENTS

HENDREY RELAYS LTD.

BATH ROAD CIPPENHAM SLOUGH. TEL.: BURNHAM 609/610



2 PART
LINE TAPS
WITH CAPTIVE PAD

INSULATED LINE TAPS

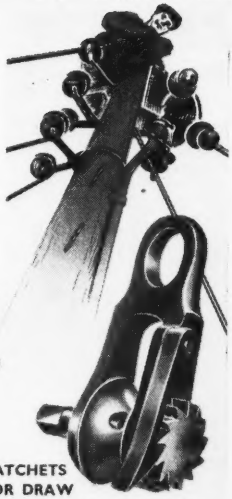
STEEL AND
NON-FERROUS
WIRE ROPE
CLIPS

MIDSPAN TENSION JOINTS

# Bowthorpe
# OVERHEAD FITTINGS and LINESMEN'S TOOLS

Please write for our new illustrated catalogue for details of complete range.

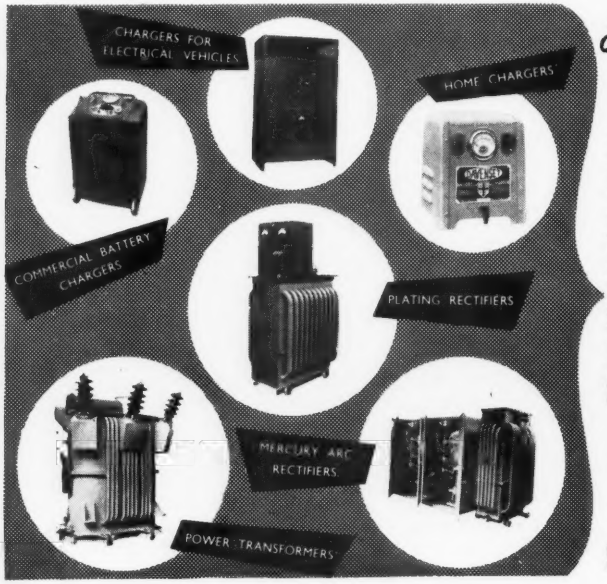
K. P. DRAW TONGS



RATCHETS
FOR DRAW
TONGS (HEAVY PATTERN)

BOWTHORPE ELECTRIC CO. LTD., TINSLEY LANE, CRAWLEY, SUSSEX CRAWLEY 747/8/9






# In the Service of Industry

The Davenset Range of Electrical Equipment is designed for the needs of Industry. It consists of Power Transformers up to 500kVA, Mercury Arc and Selenium Rectifiers for Battery Charging, plating, precipitation, etc.

We specialise in the design and construction of all types of Electrical Equipment built to suit our customers' individual requirements.

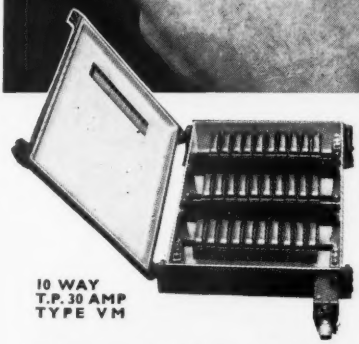
*Please send now for free copies Booklets Nos. 207, 214, 217.*

DAVENSET

**INDUSTRIAL ELECTRICAL EQUIPMENT**

*Built from the First to Last.*

**PARTRIDGE WILSON & CO. LTD.**
Davenset Works, Leicester



10 WAY
T.P. 30 AMP
TYPE VM

The full range of Aeroflex-Fluvent 15 amp. and 30 amp. Fuse Distribution Boards is equipped with Aeroflex High Breaking Capacity Rewireable Cartridge Fuses, which being automatically retained in the fuse bridge, ensure quick replacement of blown cartridges. In addition, these Distribution Boards are fitted with entirely removable end plates, which facilitates drilling for cable glands and conduit holes according to requirements.

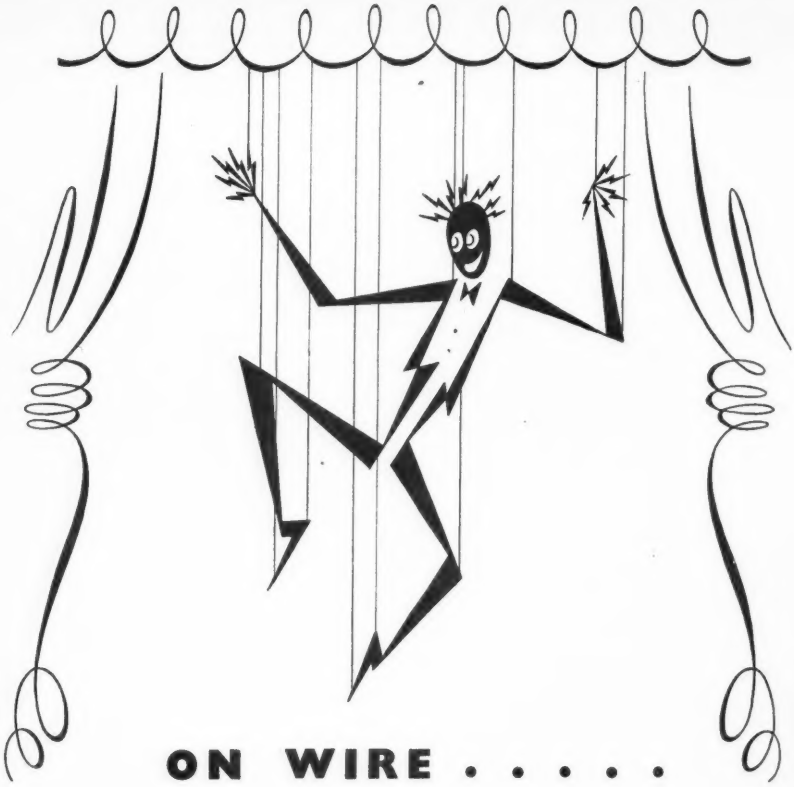
● Removable Endplates Facilitates Drilling

AEROFLEX
Fluvent
HOPE'S PATENTS

LONDON: 34 Victoria Street, S.W.1.
GLASGOW: 162 Buchanan Street, C.1.

PARMITER HOPE & SUGDEN LTD.
FLUVENT Electrical Works, Longsight, MANCHESTER, 12

dm FH 25



# ON WIRE . . . . .

we are experts in the production of insulated wires. Our extensive range includes " Simvar " covered wire, famous for flexibility and resistance to abrasion, withstanding the solvent action of practically all insulating varnishes.

*Write for a comprehensive list of our products.*

**F.D.SIMS**
LIMITED

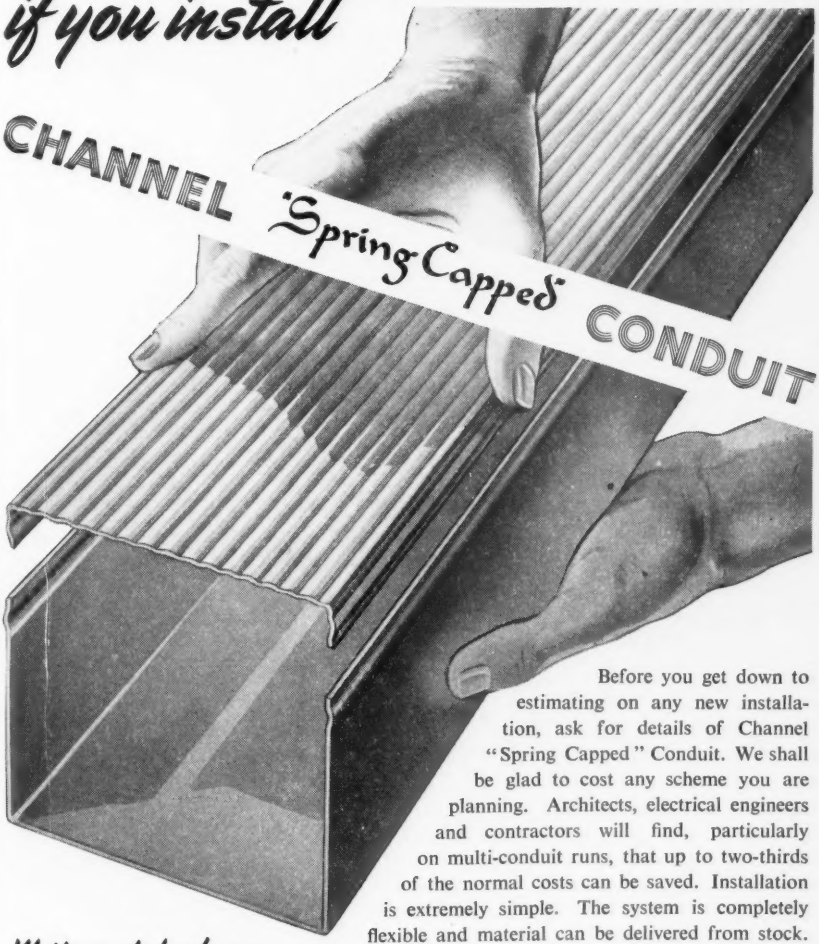
**HAZELHURST WORKS • RAMSBOTTOM • LANCS**
*Telephone :* RAMSBOTTOM 2213-4 *Telegrams :* " SIMS, RAMSBOTTOM "

**London Office : 1 SHERWOOD ROAD, ADDISCOMBE, CROYDON**
*Telephone : ADDiscombe 2848*

511

# You can save up to ⅔ of your costs if you install

## CHANNEL 'Spring Capped' CONDUIT



Before you get down to estimating on any new installation, ask for details of Channel "Spring Capped" Conduit. We shall be glad to cost any scheme you are planning. Architects, electrical engineers and contractors will find, particularly on multi-conduit runs, that up to two-thirds of the normal costs can be saved. Installation is extremely simple. The system is completely flexible and material can be delivered from stock.

*Write or telephone*

**CHANNEL CONDUITS (1949) LTD · 11 VICTORIA STREET · LONDON · SW1**

*Phone : Abbey 2027. Telegrams : "Chancon, Sowest, London"*

**ALSO AT RUGBY, ST. HELENS AND IRVINE, SCOTLAND**

TBW 6

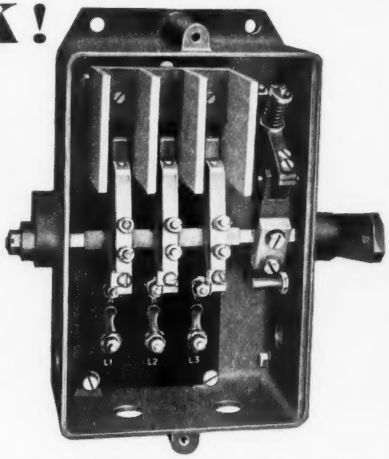
# LOOK!

AUTOMATIC DIRECT TO LINE STARTER

**LOOM SWITCHES**

OF EXTREMELY ROBUST DESIGN

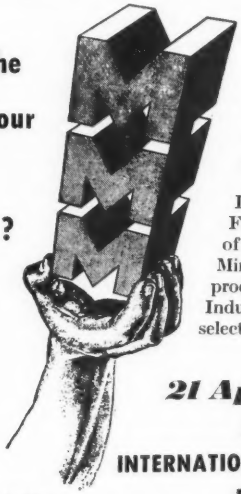
ALSO USED AS HAND OPERATED CONTACTORS WHERE FREQUENT OPERATION IS REQUIRED




**MORECAMBE ELECTRICAL EQUIPMENT CO. LTD.**

Telephone 1414/5 WESTGATE WORKS, MORECAMBE Telegrams: "MEECO"

**What is the state of your Factory Equipment ?**



That your factory plant should be improved in order that production may be increased is a matter of great concern to you.

If you visit the Third International Liege Fair you will find there such an assembly of articles that are of importance to the Mining Industry, to Metallurgy, to Machine production and to Electricity as applied to Industry, as will enable you to make a wise selection of the goods you require.

***21 April – 6 May, 1951***

**3RD INTERNATIONAL FAIR Liege**

Mining, Metallurgy, Mechanical and Electrical Engineering

*Write to Foire Internationale de Liege, 17 Boulevard d'Avroy, Liege, Belgium, for prospectus and information which will help you to plan your visit to the European Exhibition, devoted to specialised and technical industries.*

*Photograph taken at the works of Ruston & Hornsby Ltd., Lincoln*

*It will save you time and money. All over the world machinists are using*

# STAG MAJOR SUPERWELD TOOLS

*FOR TURNING, PLANING, SHAPING, ETC.*
*WHY NOT YOU ?*

WE ALSO MAKE
TOOL STEELS, DIE STEELS,
TUNGSTEN-CARBIDE TIPPED TOOLS,
TWIST DRILLS, STEELS FOR
PLASTIC MOULDS AND HOBS, ETC.

**THESE ARE THE FACTS :**

1. LARGE STOCKS READY FOR IMMEDIATE USE ARE HELD.
2. STAG MAJOR TUNGSTEN-COBALT HIGH-SPEED STEEL IS USED FOR THE CUTTING EDGE.
3. LOW COST.
4. READY HEAT-TREATED BY EXPERTS.
5. TOOL FORGING AND HARDENING PLANT CAN BE SCRAPPED.
6. NO STEEL SPOILED IN HEAT-TREATMENT.
7. 550 DIFFERENT STANDARD TOOLS IN 15 SECTIONS, SOLID ENDS BUTT-WELDED, NOT BRAZED TIPS.
8. SPECIAL SHAPES TO ORDER.

**To EDGAR ALLEN & CO. LTD.**
**SHEFFIELD 9**
**Please post "SUPERWELD TOOLS" to**

Name .....
Position .....
Firm .....
Address .....
.....
E.R.

**EDGAR ALLEN & CO. LIMITED.**
**IMPERIAL STEEL WORKS:- SHEFFIELD.9**

# 'ENGLISH ELECTRIC'
## ignitrons

### Precision
### in Process Control

The Ignitron is designed for precision control of processes involving the use of comparatively low voltages and high currents—for example, resistance welding and X-Ray exposure control. It exhibits some important advantages over other methods; the ignitron combines the precision and freedom from mechanical problems of the thermionic valve with the robustness of the contactor; it is compact, moderate in weight and has a long life. 'English Electric' Ignitrons are made in a range of standard sizes, interchangeable with all other types in common use. They can be water-cooled and are suitable for line voltage of 250-600 volts.

**The ENGLISH ELECTRIC Company Limited**

QUEENS HOUSE, KINGSWAY, LONDON, W.C.2

Rectifier Sub-station Department, Stafford

*Works: STAFFORD · PRESTON · RUGBY · BRADFORD · LIVERPOOL*

# 43 YEARS OF RELIABLE SERVICE IN THE DISTRIBUTION OF RELIABLE ELECTRIC SUPPLIES

CMA ELMA ASCM ELFA BEAMA

Cables
Lamps
Conduits
Fittings
Heating and Cooking Appliances
Ironclad and Branch Switchgear
Accessories in General

E.W.F. ELECTRICAL WHOLESALERS FEDERATION MEMBER

**WE HANDLE HIGH-CLASS MATERIAL ONLY**

*OUR ADDRESSES:*

| LIVERPOOL | MANCHESTER | CARLISLE | BIRKENHEAD | WORKINGTON |
|---|---|---|---|---|
| 1-9 Stanley St. | 30 Pall Mall | Paternoster | 94 Chester St. | Oxford Buildings |
| Central 5491 | Deansgate 5627 | Row | Birkenhead | Oxford Street |
| (10 lines) | (4 lines) | Carlisle 631 | 4340-1 | Workington 139 |

**DOWNES & DAVIES LTD.**

# PREVENT SABOTAGE by Dust and Dirt!

**It is an undisputed fact that dust and dirt can cause serious breakdowns if allowed to accumulate—particularly in machinery and equipment which cannot easily be washed or brushed out. The answer lies in "Secomak" Portable Electric Blowers—the most powerful of their kind obtainable and equally useful as suction cleaners.**

**Model 7 weighs only 10 lbs. but delivers air at 340 ft. per sec.**

**Model 70 weighs 15 lbs. and delivers air at 425 ft. per sec. with static pressure of 33 in. w.g.**

Write for Leaflets Nos. 101/42E and 102/29E

Secomak REGD. ELECTRIC BLOWERS

*Both these models may be used with the Secomak Heater Attachment to blow air at temperatures up to 200° C.*

**SERVICE ELECTRIC CO. LTD.**

Secomak Works, Honeypot Lane, Stanmore, Middlesex — *Telephone: EDGware 8631-2-3-4*

# CAPACITORS

*to meet*

# INDUSTRIAL

*needs*

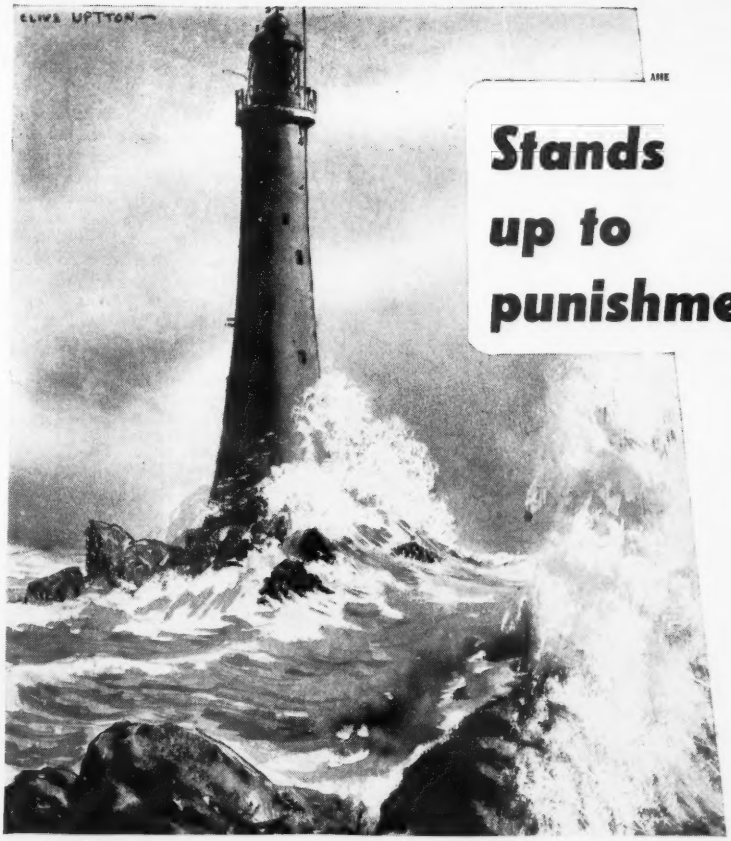
DRY ELECTROLYTIC
METALLISED PAPER
FOIL & PAPER
SPECIAL MICA ETC.

REGISTERED TRADE MARK
**HUNTS**
**CAPACITORS**
THE TRADE MARK OF RELIABILITY

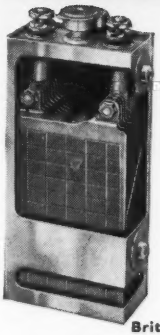
*Consult the Specialists . . .*

Request our advice, without obligation, on capacitors for Power Factor Improvement, Phase Splitting, Capacitor Motors, Fluorescent Lighting, Interference Suppression and other Industrial Applications.

**A. H. HUNT LTD., WANDSWORTH, LONDON, S.W.18 Tel: BATtersea 3131 Est. 1901**



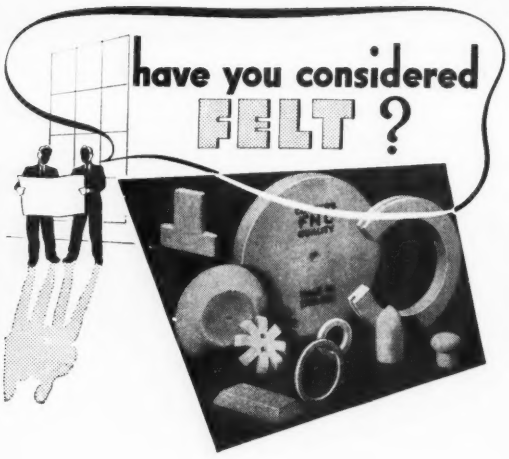

# Stands up to punishment



Like the lighthouse, the Alklum Steel-Alkaline Battery is built to withstand rough conditions. An all-steel welded container and sturdy plate construction ensure unvarying reliability in strenuous use. Compact, economical to maintain and quick to recuperate, Alklum is the obvious choice when unfailing reliability is essential.

**ALKLUM** STEEL-ALKALINE BATTERY

**Britannia Batteries Limited** · 66 Victoria Street, London, S.W.1. Telephone: Victoria 9661—2



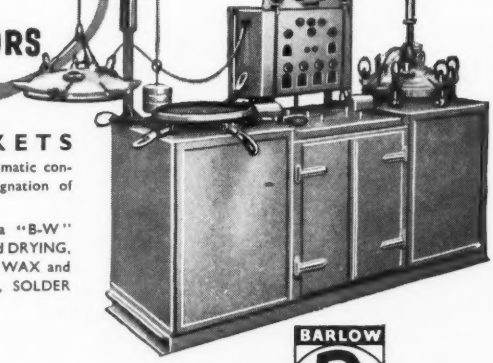

On the 'Mauretania' and the two 'Queens,' on railway systems throughout the world, certainly in your own car, Cooper's Felt is proving an invaluable material for a surprising number of purposes. Have you considered felt? One of Cooper's experts will be happy to answer any questions.

COOPERS FELT

*Telephone: NORthern 2194-5* *Telegrams: Felting, Birmingham*

**COOPER & CO. (B'HAM) LTD., LITTLE KING STREET, BIRMINGHAM 19**

**'B-W' ELECTRIC IMPREGNATORS**



**EXPORT MARKETS**

For 100% RELIABILITY under all climatic conditions vacuum and pressure impregnation of electrical equipment is essential.

Compact self-contained plants are a "B-W" speciality. "B-W" also make very good DRYING, PRE-HEATING and BAKING OVENS, WAX and COMPOUND KETTLES and TANKS, SOLDER POTS, TINNING BATHS, etc.

Electrically heated, of course.

**FOR ELECTRICALLY HEATED EQUIPMENTS**

BARLOW WHITNEY

**COOMBE ROAD · NEASDEN LANE · LONDON, N.W.10**

*Telephone*: Gladstone 1152-3 - - *Telegrams*: "Calidus" Harles, London

# BSR Induction Motors...

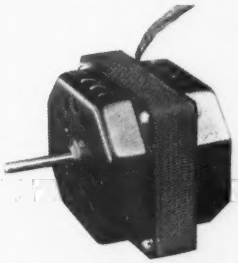
A RANGE OF INDUCTION MOTORS ideal for gramophone motors, motion displays, wire and tape recorders, fans, switch movements and indeed every application demanding a constant speed vibration free motor

### FOUR POLE MOTOR FP10

A precision engineered well balanced motor, designed to give constant trouble free performance indefinitely. This motor is used extensively in many wire and tape recorders, and gramophone units now manufactured.

The F.P. 10 has these attractive features
- Fully protected.
- Dual voltage range.
- Negligible external magnetic field.
- Oil impregnated self aligning bearings.
- Speed constancy and silent running.

Speed (light) 1400 r.p.m.—Torque 3 inch ozs. Weight $1\frac{3}{4}$ lbs.



Motor F.P.10.

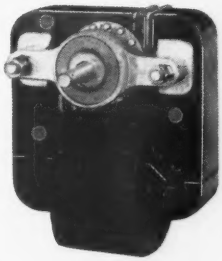
### TWO POLE MOTORS SR1 & SR2

A rugged and highly efficient motor that will stand heavy overloads, and for intermittent ratings is capable of giving up to twice the rated power.

Used extensively in many motion displays, fans and gramophones now manufactured.

SR1 MODEL: Speed (light) 2750 r.p.m. Torque 3.0 inch ozs.—Weight 2.31 lbs.

SR2 MODEL: Speed (light) 2750 r.p.m. Torque 2.0 inch ozs.—Weight 1.7 lbs.

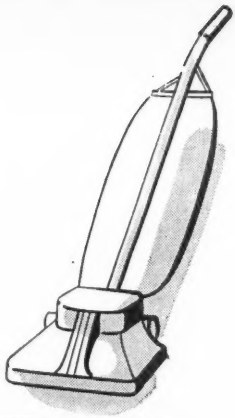


Motor S.R.1.

## ...Leaders in their field

**Birmingham Sound Reproducers Limited, Claremont Works, Old Hill, Staffs. Tel: Cradley Heath 6212/3.**

# keep it going... ... longer



## with "BICALEX" Winding Wire

It's the synthetic enamel covering that keeps "BICALEX" Winding Wires so reliable — for so long. They're ideal for high-speed winding... for jobs where abrasions are sometimes unavoidable. You can stretch, twist, and even flatten "BICALEX" Wire without damaging the insulation. No wonder it is used in some of the best vacuum cleaners, washing machines, and other domestic appliances built for long service.

*May we send you details of the types and range of "BICALEX" Winding Wires in Publication No. 267 W*

**BICC MAKE WINDING WIRES AND STRIP FOR EVERY ELECTRICAL PURPOSE.**

**BRITISH INSULATED CALLENDER'S CABLES LIMITED**
**NORFOLK HOUSE, NORFOLK STREET, LONDON, W.C.2**

A B.I. Callender's PRODUCT

Burco
THE SUPREME ELECTRIC WASHBOILER
BURCO LTD · ROSE GROVE · BURNLEY · LANCS

# GEARED MOTOR UNITS

There are some drives whose requirements can be met by fitting standard mass-produced F.H.P. motors. But they are the exception —not the rule. The modern Production Engineer, with a shrewd eye on maintenance costs, realises that the true economy in the long run is to suit the motor to the drive and not order "the nearest standard size." As specialists of long standing in the matter of designing and applying high-grade fractional horse-power motors and geared motor units to specific commercial and industrial needs, we invite you to consult us on your F.H.P. problems. The same satisfaction which we have been able to afford our thousands of customers during the last twenty-five years will be yours also.

*Consult*

CROYDON

**CROYDON ENGINEERING Co. Ltd., Commerce Way, Purley Way, Croydon**
**TELEGRAMS: SYNCROY, CROYDON PHONE: CRO. 4125 (4 lines)**

## *They are cleaning up with this job*

One of our biggest projects at the moment is making the parts for the Electrolux Vacuum Cleaner. One of these parts, the Suspension Bracket, presented us with some tricky problems.

This intricate moulding had to be light in weight, strong, and produced in large numbers to fine limits of accuracy at a modest price. Plastics provided the most suitable material for this application.

This is just another of those complicated jobs we enjoy doing for our customers.

*If you want to know what Plastics can do for you—*

# ask Ashdowns

ASHDOWNS LIMITED, ECCLESTON WORKS, ST. HELENS, LANCS. Tel. : St. Helens 3206

*Ashdowns Ltd. is a subsidiary of Pilkington Brothers Ltd.*

---

## Guaranteed Electrical Installations

*Membership*

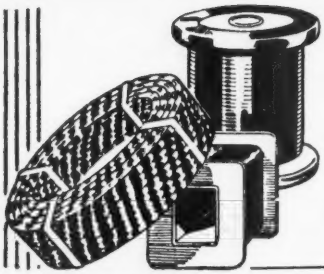
of the Electrical Contractors Association is a privilege to those contractors who can offer skill and experience combined with a genuine desire to be of service to users of electricity. They agree to comply with rigid standards of workmanship and installations carried out by them are financially guaranteed by the Association. For a safe and efficient installation place YOUR electrical work in the Safe Hands of an ECA member.

ELECTRICITY IN SAFE HANDS

*For the names and addresses of ECA members in your area, write to the*

ELECTRICAL CONTRACTORS ASSOCIATION (INC.)

AFRICA HOUSE, KINGSWAY, W.C.2

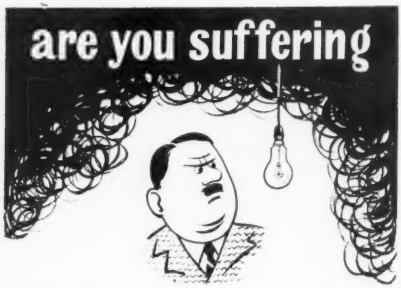


## INSTRUMENT WIRES
## INSULATING MATERIALS

**ENAMELLED, SILK and COTTON covered Copper Wires, Single or Stranded, also Tinned, Paper, Asbestos and Plastic Westoflex covered. RESISTANCE WIRES. LITZ WIRES.**

**MICA, MICANITE and BAKELITE in all forms. Heat Resisting Boards. Canvasite for Silent Gears. Oil Cloth, Silk and Paper. Slot Insulations. Insulation Varnishes. Varnished Fabric and Plastic Sleeving. Moulded and Machined Pieces, etc.**

**WEST INSULATING COMPANY LTD.**
2 Abbey Orchard Street, Westminster, S.W.1
Telephones: Abbey 2814 & 7352



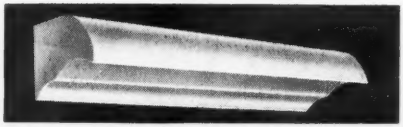

## needless power cuts ?

Don't lose electric light.
Concentrate your light with

Wafax REFLECTORS

**WADES** (Metal Spinners) Ltd.
HALIFAX
Phone 61637

Saxon



## "MIRRORLIGHT"
U.B.O.21

### Fluorescent Lighting Unit

Finished in Bronze or Silver as standard. (Other colours to special order.) Designed for use as Bed-lights and the illumination of Mirrors, Pictures, etc. Self-contained Control Gear.

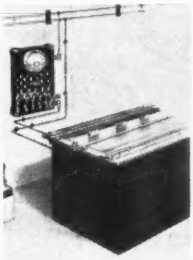
For use with single or twin 20-or-40 watt tubes

**SAXON COMPONENTS LTD.**
66 Victoria Street, London, S.W.1
Telephone: VICtoria 0804, 4268, 4269

CANNING

## TIN PLATING
*FOR ELECTRICAL CONTACTS*

Write for details:
**W. CANNING & CO. LTD.**
BIRMINGHAM 18



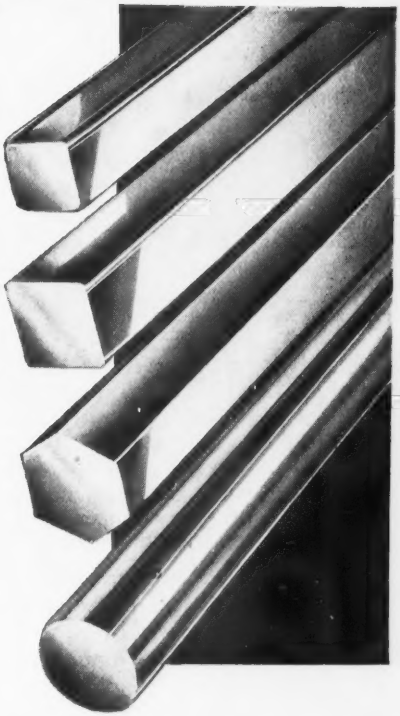
HEDIN

## INDUSTRIAL ELECTRIC HEATERS AND RESISTANCE UNITS

Commerce (Trading) Estate, South Woodford, E.18

# COPPER FOR ELECTRICAL PURPOSES

# RODS AND BARS



Manufactured from Wire Bars of guaranteed highest purity which are fabricated entirely in our own factories. The final product is of perfect quality, bright and free from discoloration.

FS & CO. — ANACONDA REGD. — THE MARK OF A QUALITY PRODUCT

**FREDERICK SMITH & COMPANY**

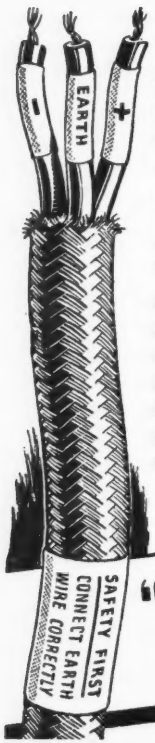
ANACONDA WORKS : SALFORD 3 : LANCS

*Incorporated in The London Electric Wire Company and Smiths, Limited*

*Associated with The Liverpool Electric Cable Co., Ltd. and Vactite Wire Co. Ltd.*

# WHICH is WHICH ?

## You KNOW, but do your customers know ?




To follow the "Safety First" recommendation, make sure your electrical leads, whether to Domestic Appliances or to Machine Tools, etc., are clearly defined.

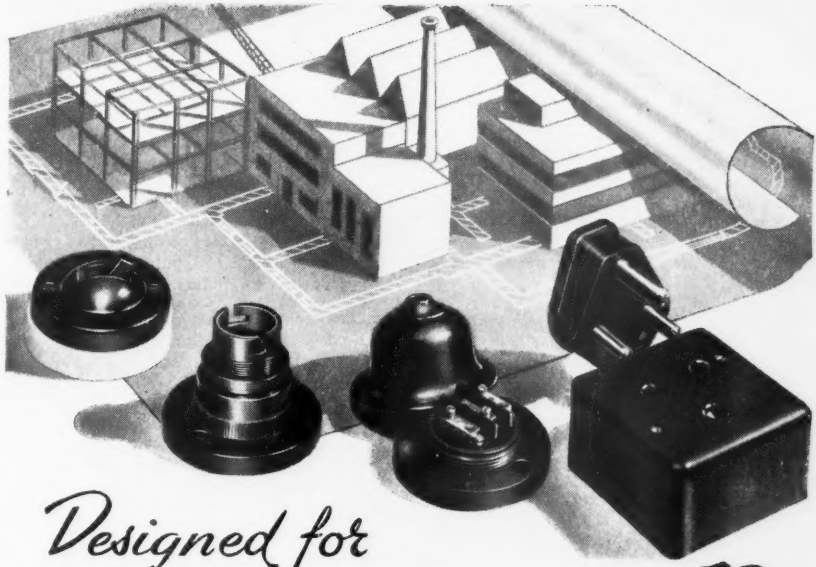
"Viskrings" simply slipped over the core-wires and/or the outer casing of the leads do the job and put an end to confusion or doubt.

- *No tools required*
- *No rubber used*
- *Impervious to oil and petrol*
- *Indelibly printed*
- *Supplied in all colours as well as white*
- *Self-fixing*
- **Do not increase diameter of lead**

# "VISKRINGS"

for
PERMANENT IDENTIFICATION
OF ELECTRIC LEADS

**VISCOSE DEVELOPMENT CO. LTD.** *WOLDHAM ROAD, BROMLEY KENT. Ravensbourne 2641*



*Designed for*

# DEPENDABILITY...

★ **MADE TO APPROPRIATE BRITISH STANDARD SPECIFICATIONS** ★

Whether it be a single replacement point or a complete Electrical Installation the choice of the most dependable Electrical Accessories is the finest safeguard against electrical breakdowns.

**Choose Wisely – Choose W & G Electrical Accessories to appropriate B.S. Specifications.**

Manufacturers of Electrical Equipment for over half a century – an assurance of reliability, design and fine quality.

ELECTRICAL ACCESSORIES W&G MADE IN ENGLAND FINE QUALITY

*Fine quality*

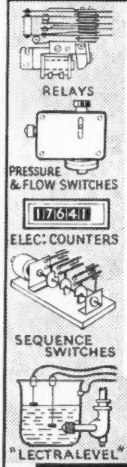
## ELECTRICAL ACCESSORIES

**WARD & GOLDSTONE LTD.**

PENDLETON MANCHESTER 6

C 669

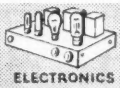
# ELECTRICAL AUTOMATIC CONTROL APPARATUS

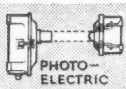



## *for* INCREASED PRODUCTIVITY

In almost every Industry, Electrical Engineers are **saving manpower and cost, safeguarding plant and personnel** and **increasing accuracy and quality** by installing Automatic Electrical Control Apparatus. Every day sees new applications.

We at Londex make most of the key components, freely assist with circuit design and technical information, and when desired produce complete assemblies and control panels.



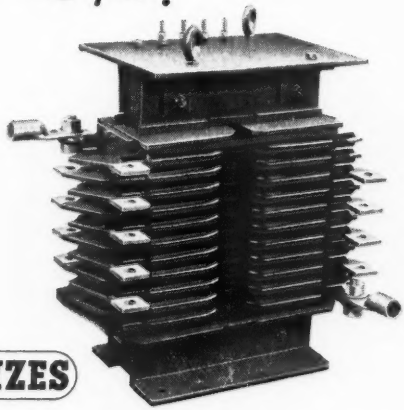



LONDEX

LONDEX LIMITED ANERLEY WORKS LONDON S.E.20 SYD. 6250/8

# The tricky ones are fun!

Thanks to 25 years' experience in design and manufacture of transformers, we can face most transformer 'headaches' with equanimity. If you want instruments which you can fit and forget, which will give you trouble-free service for years, write or telephone us.



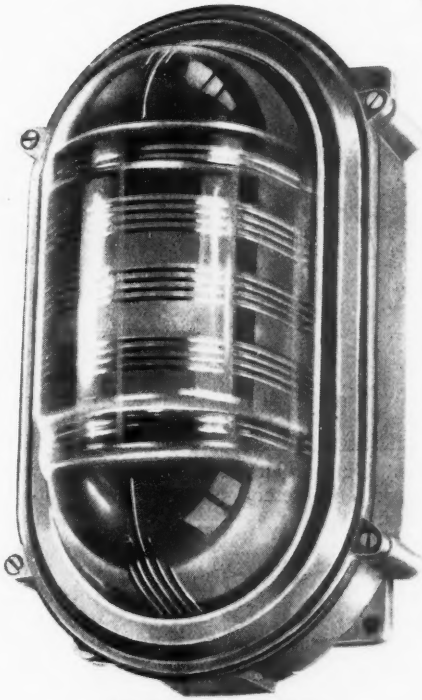
SAVAGE TRANSFORMERS OF DEVIZES LIMITED

SAVAGE TRANSFORMERS LTD., NURSTEED ROAD, DEVIZES, WILTS. *Telephone: Devizes 536*

COUGHTRIE

# *Distinguished Lighting Fittings in Aluminium Alloy*

COUGHTRIE



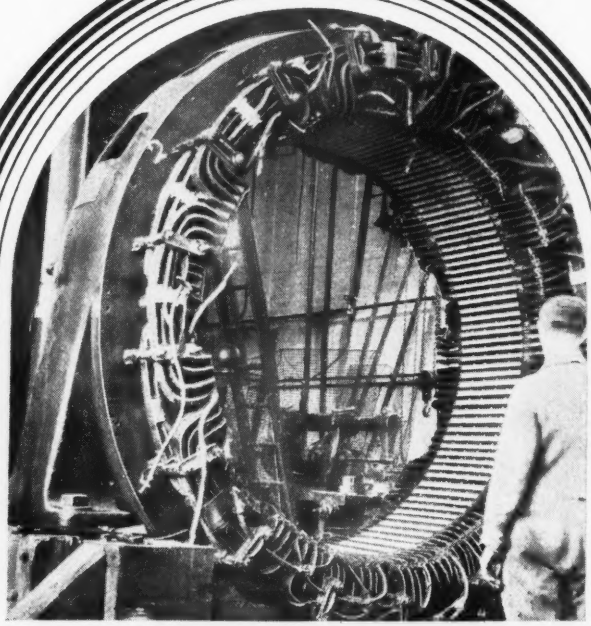
List No. S.P.10 100 Watt

MANUFACTURED BY

**J. & G. COUGHTRIE LTD.**

**HILLINGTON, GLASGOW, S.W.2**

CATALOGUE No. 511 AVAILABLE ON REQUEST



**Repairs.** One 1875 kVA., 3300 volts, 333 r.p.m. Alternator completely rewound for National Coal Board.

# COLLINS

*Collins Electrical Ltd.*

*Head Office 115 Clerkenwell Road London E C 1*

*Central London Works*

*22 St. Albans Place Upper Street Islington N 1*

*West London Works*

*9 & 11 Featherstone Road Southall*

*Phone Holborn 0212-4 Canonbury 3227-8*

*or Southall 0168*

# MERSEY

DYNAMOS and MOTORS

## DAVID McCLURE LTD.

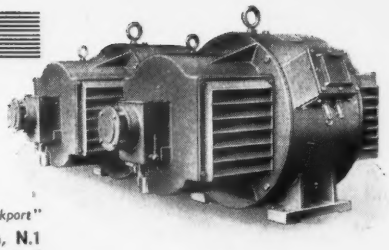
THE MERSEY DYNAMO WORKS

**STOCKPORT**

*Telephone : Stockport 3653/4.* *Grams : " Motors, Stockport"*

London Office: **47/49 Caledonian Road, London, N.1**

*Telephone : TERminus 7191/2/3.* *Grams : "Tribord, Phone, London"*



Louvred Marine Type Steering Gear Motors

# FLUORESCENT

# FITTINGS

## AT LOW COST

This single 80 watt 5' unit costs only £4 19 6 complete, plus 3/6 purchase tax on tube, subject to the usual trade and settlement discounts. One of a new range of eight (single and twin) complete fittings manufactured of high grade steel. Control gear fitted inside reflector. Available in white or cream.

*Ask for details and prices*

**ELECTRA SALES (ESSEX) LTD.**
**92 TOWER HAMLETS ROAD**
**LONDON, E.7**
Telephone : MARyland 1228

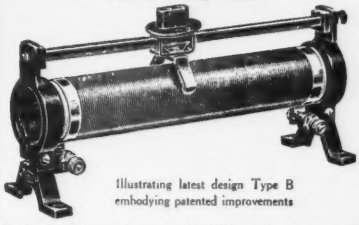
Selling Agents required for S.E., S.W. and N.W. England

REGISTERED **ZENITH** TRADE-MARK

# RESISTANCES

**FOR LABORATORY AND TEST-ROOM**

*You cannot buy better*



Illustrating latest design Type B embodying patented improvements

**Zenith Resistances of proved durability are in constant use and are giving every satisfaction in all parts of the world**

*CATALOGUE ON REQUEST*

**Unequalled Service**

**THE ZENITH ELECTRIC CO., LTD.**

Sole Makers of the well-known "Zenith" Electrical Products

**ZENITH WORKS, VILLIERS ROAD**
**WILLESDEN GREEN, LONDON, N.W.2**

Phone: WILlesden 4087-8-9 Grams: "Voltaohm, Phone, London"

# VINCENT *Switches with H.R.C. Fuses*

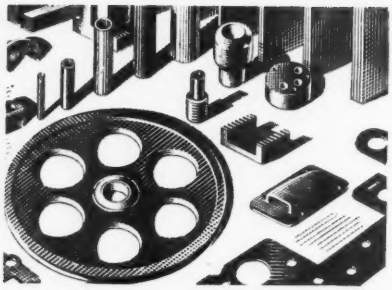
30, 60, 100 and 200 amp., D.P. and T.P.

Change-over Switches 30 amp. to 400 amp., D.P., T.P. and 4-Pole

***Please send your enquiries for H.R.C. Fuseboards***

Quick Delivery – Catalogue will be sent on request

**VINCENT SWITCHGEAR MFG. CO. LTD.** **Sampson Road North BIRMINGHAM 11**



**BAKELITE LAMINATED**

**The versatile, hard-wearing material**

For good all round electrical properties • For resistance to heat, water, oils, acids • For high strength-to-weight ratio • For ease of machining and post-forming • For resistance to wear and abrasion • For good, solid engineering qualities.

TRE FOIL

**BAKELITE PLASTICS**

REGD. TRADE MARKS

Bakelite Limited, 18 Grosvenor Gardens, London, SW1

TIOI/I

ASBESTOS
WOVEN
WIRE
RESISTANCE NETS

*COST SO LITTLE*
*and HELP SO MUCH*

Write or telephone today for full details, and technical advice if required.

**CRESSALL**

The registered Trade Name of
The Cressall Manufacturing Co. Ltd.
Tower Street, Birmingham 19
*Telephone:* ASTon Cross 2666 (3 lines)
*Telegrams:* "OHMIC," Birmingham

***NEW!***

**GA-3**

**THREAD TAP**

**HIGH-CLASS PRECISION TOOL**
(Swiss Made)

**A VALUABLE AID FOR EVERY MECHANICAL SHOP**

**Fits any drilling machine**

For Steel 14-7 BA, for Brass 14-5 BA. Fast, Clean and True Tapping of threads in any metal or insulating material. 3,000 revs. per minute. Left or right hand thread without resetting. Smooth change of gears.

*Ask for leaflet GA-3E*

**SIEGRIST OREL LTD.**
39 BERNERS STREET, W.1

**ARC SHIELDS FOR SWITCHGEAR**

Asbestos or Rubber
Gaskets, Washers, Joints

**CENTRAL MANFG. & TRADING CO. (DUDLEY) LTD.** OLD HILL, STAFFS
*Phone : CRADLEY HEATH 69181 (5 lines)*

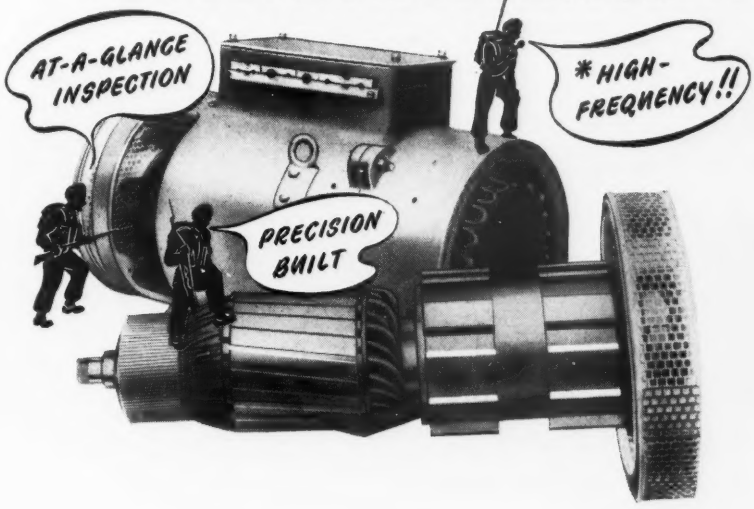
*Everything in Asbestos*

**H. J. BALDWIN & CO. LTD.**
**NOTTINGHAM**

Cable Protection Covers
Stoneware Conduits
Wireohms Electric Elements
Electric Distribution Equipment

**BRITISH INDUSTRIES FAIR**
**STAND C516—BIRMINGHAM**

# Reconnaissance...




A survey of "Electro Dynamic" Equipment promptly reveals its sterling qualities and outstanding advantages.

Here, for example, is a High Frequency Inductor Motor Alternator, precision built, providing for "at a glance" inspection and producing a wave form as near sinusoidal as possible. D.C. input. Output 500 cycles. Single phase, 8 kVA. Equally applicable to Radio, Marine and Engineering requirements.

Let us send you details or quote against your specification.

**ELECTRO DYNAMIC CONSTRUCTION COMPANY LIMITED**

*Head Office and Works:* **ST. MARY CRAY · KENT**

*Phone:* **ORPINGTON 2560-3**

**CONTROL GEAR WORKS: BRIDGWATER · SOMERSET**

# A new arrival of SUPERIOR DESIGN

## The C·B·15

**5ft 80 WATT LAMP**
**SINGLE LAMP UNIT**

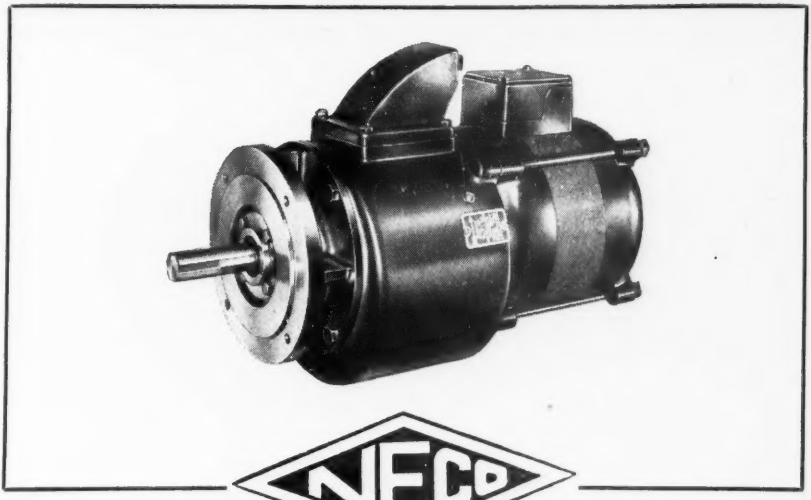
**£5·7·6**
**Including CONTROL GEAR**

Body constructed of aluminium with one piece cast aluminium end covers. Pretreated to provide efficient bonding for two coats of White stove enamel. Centre point fixing.

Full details and Export Prices from:

**SMART & BROWN (ENGINEERS) LIMITED**

TRADING ESTATE, SPENNYMOOR, CO. DURHAM



NECO

TRADE MARK

# FLANGE-MOUNTING

## GEARED MOTORS

**A New NECO Geared Motor, flange-mounted for vertical or horizontal running, with outputs from $\frac{1}{4}$ to $1\frac{1}{2}$ H.P. at speeds between 26 and 480 r.p.m. The motor can be wound for any A.C. or D.C. voltage, and single speed, 2-speed, and variable speed types are available.**

**THE NORMAND ELECTRICAL COMPANY LIMITED**

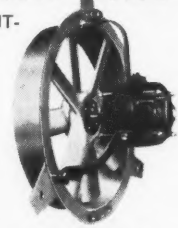
NORTH STREET, CLAPHAM COMMON, LONDON, S.W.4

TELEPHONE: MACAULAY 3211-4

*For Works, Offices and Public Buildings*

**EFFICIENT AIR TREATMENT**

AIRSCREW WALL MOUNTING TYPE FAN in heavy gauge mild steel casing. Air-grade hardwood impeller with blades of true aero-foil section.



- **Low Power Consumption**
- **Quiet Running**
- **Maximum Efficiency**

*with*

# AIRSCREW AXIAL-FLOW FANS

AIRSCREW Axial-Flow Fans ensure the conditions necessary to congenial and more productive work. The range of types and sizes, from 12" to 48" diameter, includes a fan suitable for every type of air treatment in factory, office or public building.

THE AIRSCREW COMPANY & JICWOOD LTD., WEYBRIDGE, SURREY

*Telephone : Weybridge 1600* *Telegrams : "Airscrew, Weybridge"*

*BRANCH OFFICES*—LONDON : Grosvenor Gardens House, Victoria, S.W.1. Victoria 4527. MANCHESTER : Colwyn Chambers, 24 Mosley Street, Manchester, 2. Central 5892. BIRMINGHAM : 319 County Chambers, Corporation Street, Birmingham, 2. Central 1051/2. CARDIFF : 3 Park Road, Radyr, Cardiff. Radyr 125. SCOTLAND : 239 St. Vincent Street, Glasgow, C.2. Central 5938

*Accent on Quality*

# KLAXON

*ELECTRICAL PRODUCTS*

*MOTORS*

Fractional H.P. and Geared Motor Units: Synchronous Motors. Unlimited range. Unique features. 40 years' leadership.

*SIGNALS*

Industrial & Marine Warning Signals. Indispensable to safety and efficiency ashore and afloat. Types to meet all conditions.

KLAXON, LTD., 201, Holland Park Avenue, London, W. 11.

on

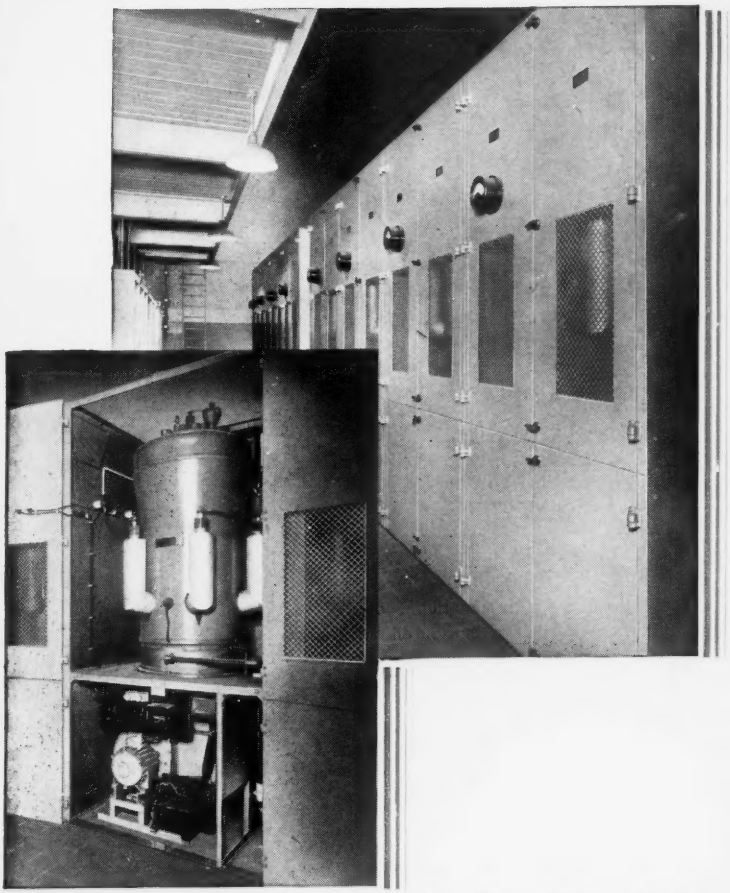
S

The
in

E Y
e"
R :
ers.
25.

arn-
able
ency
ypes
ns

REVIEW



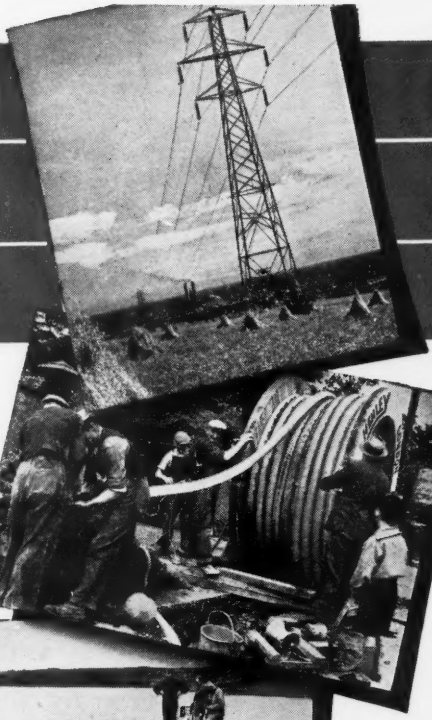
***Pumpless...Air-cooled...Steelclad...***

**Rectifiers**

*by* **G.E.C.**

THE GENERAL ELECTRIC CO. LTD., MAGNET HOUSE, KINGSWAY, LONDON, W.C.2

# Specialists in Super-Tension Installations



**Henley's specialise in the complete manufacture and installation of super-tension cables and accessories and in the erection of overhead transmission lines.**
**Ask for Henley Super-Tension Literature.**

BY APPOINTMENT
ELECTRIC CABLE
MANUFACTURERS

HENLEY

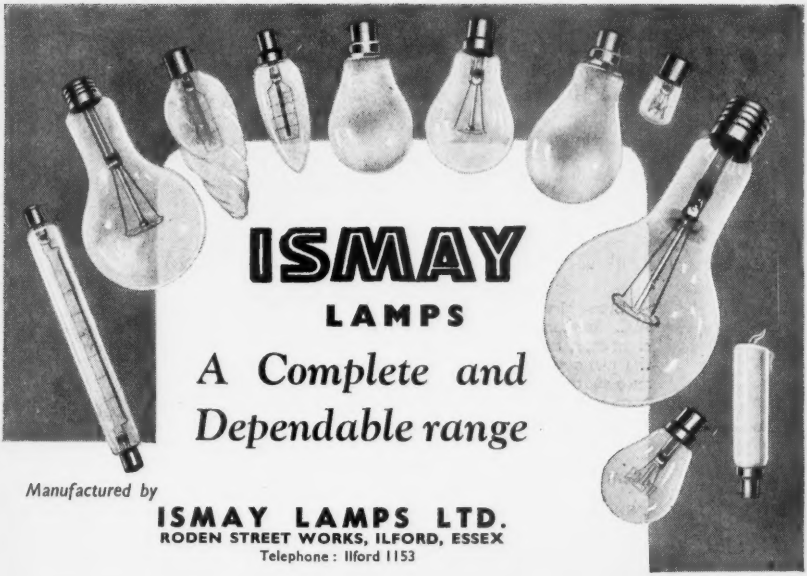
W. T. HENLEY'S TELEGRAPH WORKS CO. LTD., 51-53 HATTON GARDEN, LONDON, E.C.1

NTMENT
CABLE
TURERS

Y

N, E.C.I

REVIEW



# ISMAY

## LAMPS

*A Complete and Dependable range*

*Manufactured by*

**ISMAY LAMPS LTD.**
RODEN STREET WORKS, ILFORD, ESSEX
Telephone: Ilford 1153

**AT A FRACTION OF COST**
**LATEST TYPE**
**EVERSHED & VIGNOLES**
# BRIDGE MEGGER
**Testing Sets (Series 2)**
in leather carrying cases.
Resistance Bridge Range
0.01 ohm to 200 Megohms

**£12 . 10 . 0 to £17 . 10 . 0 each**
**Packing and Carriage 5/- extra**

These instruments (new price over £60), although secondhand, are in perfect working order and carry an efficiency label from A.I.D. examiners

## R.C. RADIO-ELECTRIC LTD.
4 Conduit Court, Long Acre, LONDON, W.C.2
Telephone: Temple Bar 0233/4
Telegrams: "Loudsigs, Rand, London"

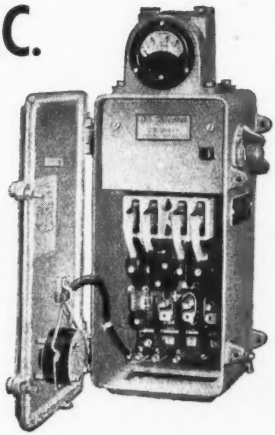
# Weir
**AMMETERS & VOLTMETERS**

(Dial Sizes from 2" to 8")
MOVING IRON, MOVING COIL, RECTIFIER TYPES
SWITCHBOARD, MINIATURE, CONTROLLER, PORTABLE
Special instruments to customers own requirements
Shunts up to 10,000 amperes

London Office — 147 Strand, London, W.C.2
Telephone Tem. 3357

THE WEIR ELECTRICAL INSTRUMENT CO. LTD.
BRADFORD-ON-AVON · WILTS
TELEPHONE:— BRADFORD-ON-AVON 2378

# Standard A.C. and D.C. Motor Control Equipment



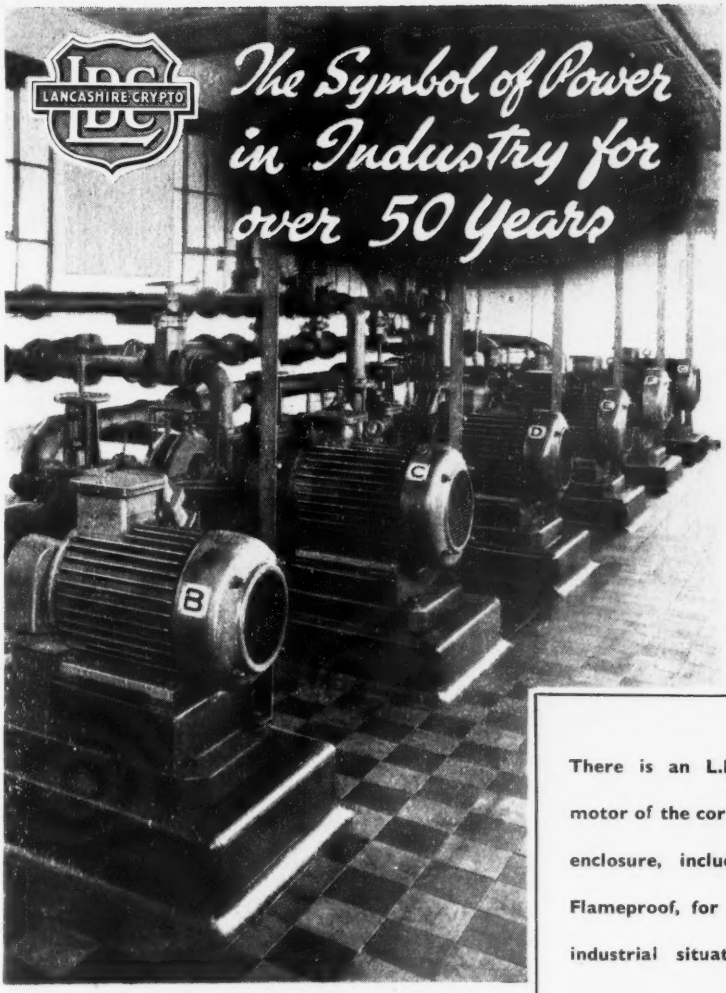
A Brookhirst Standard Type 'SC' A.C. Starter comprising ammeter, contactor, isolator, and compensated thermal overload trips with hand-off-auto switch in lid for remote two-wire control.

Standard starters provide for every normal requirement; no-volt overload protection, isolation, cabling, metering, etc., and many sizes are stocked for quick delivery. The new standard range extends the availability on short delivery to many equipments having features previously regarded as special and usually involving delayed delivery. Ask for the nearest standard to suit your requirements.

**Write for Catalogue No. 30C.**

BROOKHIRST

**BROOKHIRST SWITCHGEAR LIMITED, CHESTER**




A line of L.D.C. "Fankuld", Flameproof continuously rated S.C.R. motors, 22½ H.P., 1460 r.p.m., 500 v., 50 cycles, 3-phase. Driving oil pumps at Fell Coke Works, Consett Iron Co. Ltd.

There is an L.D.C. motor of the correct enclosure, including Flameproof, for any industrial situation.

One of the IDH Group

LANCASHIRE DYNAMO AND CRYPTO

TRAFFORD PARK, MANCHESTER 17. WILLESDEN, LONDON, N.W.10.

# DEXRAY SWITCH SPLITTERS

**These Switch and Fusegear units are a complete installation set comprising a D.P. main switch controlling a two, three or four way D.P. or S.P. & N. fuseboard.**

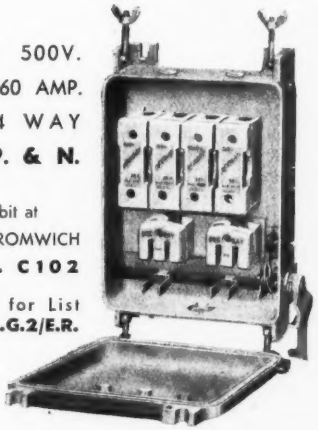
**SWITCH.** Quick make and break action.

**FUSES.** Rewirable porcelain arc damping pattern.

**WIRING.** Ample wiring space for multiple cables.

**CASES.** Machine cast in best grey iron or zinc base alloy.

250V. AND 500V.
30 AMP. TO 60 AMP.
2, 3 AND 4 WAY
**D.P. OR S.P. & N.**



See our exhibit at
**B.I.F.** CASTLE BROMWICH
**STAND No. C102**

Write for List
**No. S.G.2/E.R.**

*AGENTS :*

**BARRIES**

ELECTRICAL AGENCIES LIMITED
KING STREET, BRIGHTON 1
*Telephone : Brighton 28366 P.B.X. (7 lines)*

# *Electrical Insulation*

**MICA**

Washers
Plates
Commutator Segments
Stampings
Stove Plates
Heater Strips,
etc.

**MICANITE**

Mouldings, Commutator Vee Rings, Tubes, Covered Bars, Commutator Segments, Heater Strips, Sheet Material in Moulding, Flexible, Heat Resisting and Commutator Qualities, etc.

**BAKELITE**

Tubes
Bushes
Bobbins
Washers
Stampings
Panels
Covered Bars,
etc.

*Manufactured by*

# EAST LONDON MICA WORKS

**Ringwood Road, Walthamstow, London, E.17.** *Phone: KEYstone 4254. Grams: "Elmicmer, Easphone, London"*

Non-corrodible die-cast top member
Rubberised asbestos washer
All-porcelain body, incorporating lampholder in one piece
Fixing screws, 2 in. centres
Heavy gasket providing positive watertight joint
Screw neck pressed glass globe
STANDARD DISPERSIVE REFLECTOR MODEL
STANDARD ANGLE-CONCENTRATING REFLECTOR MODEL
STANDARD DISTRIBUTIVE REFLECTOR MODEL

# R·E·A·L

## *Non Corrodible Watertight Fittings*

*Send for Leaflet of Complete Range*

60 WATT FITTINGS
100 WATT FITTINGS
200 WATT FITTINGS

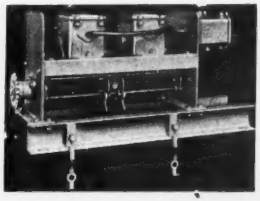
*Issued by ROWLANDS ELECTRICAL ACCESSORIES LTD. • R.E.A.L. WORKS, BIRMINGHAM 18*

# CABLE DRUMS FOR ALL MOVING STRUCTURES

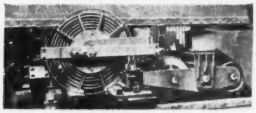
**DECO products**

*include*

Contact Collector Columns, Limit Switches, Overhead Collector Equipment, Winch Limiting Mechanisms for Skip Hoists, Cranes and Mechanical Handling Plants, Cable Reeling Drums.



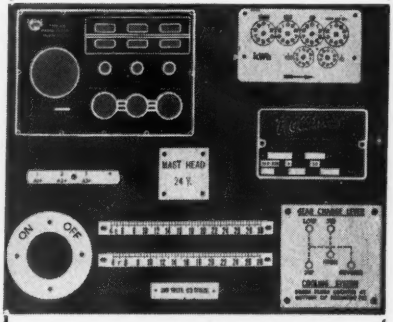
CABLE REELING DRUMS



**DECO ENGINEERING CO LTD**
West Row, N. Kensington, London, W.10 Ladbroke 3066-7

# ENGRAVED AND PRINTED NAMEPLATES SCALES, DIALS, etc.

IN PLASTICS AND METALS




**ABBOT, BROWN & SONS LTD.**
Barnfleet Works, Beaminster
Dorset *Phone 304*

# MERITUS

**RECTIFIERS**
INDUSTRIAL AND PLATING

**TRANSFORMERS**
AIR AND OIL COOLED. 10VA—100kVA

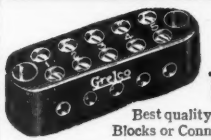
**BATTERY CHARGERS**
FOR ALL INDUSTRIAL USERS

**LOW VOLT LIGHTING**

*ENQUIRIES TO :—*

**MERITUS (BARNET) LTD.**
BARNET, HERTS
Grams : "Meritus, Barnet." Phone : Barnet 2291/2

*EXPORT DEPARTMENT :* 131 VICTORIA ST., S.W.1
Cables : "Nathallect, London." Phone : Victoria 1083




# Grelco TERMINAL BLOCKS

Best quality, black bakelite, Terminal Blocks or Connectors. Used extensively for telephones, telegraphs, radio, bells, signals, relays, traffic signals, etc., 2, 3, 4, 5, 6, 8, 10 and 12 way in 5 Types.

*Fully illustrated descriptive Folder on application*

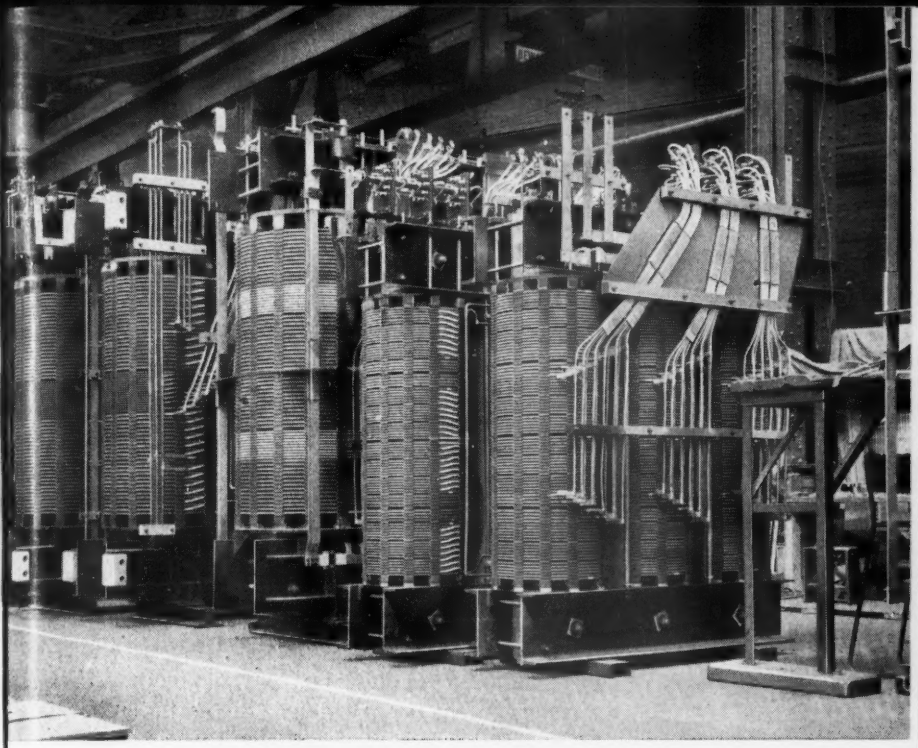
**GRELCO Ltd., Grelco Works, Hopcott, Minehead, Somerset**

# 'INVISAFLEX'

*No. 65*

This attractive adjustable Desk Standard with the Patent "Invisaflex" Bracket Joint is obtainable in a variety of "finishes" from all leading Electrical Wholesalers.

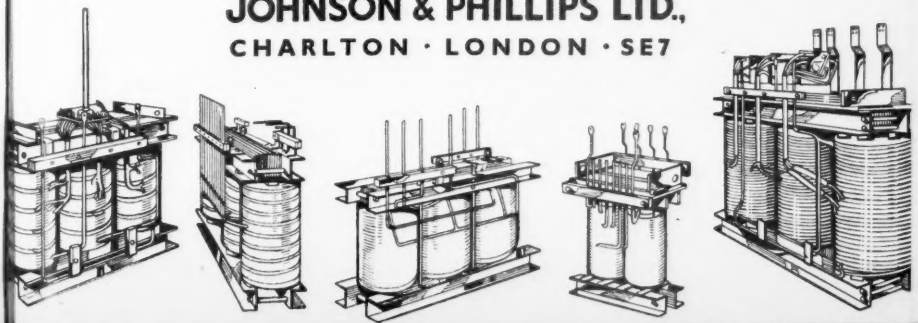
ELECTRICITY SERVICES LTD.
86 CANNON STREET, LONDON, E.C.4

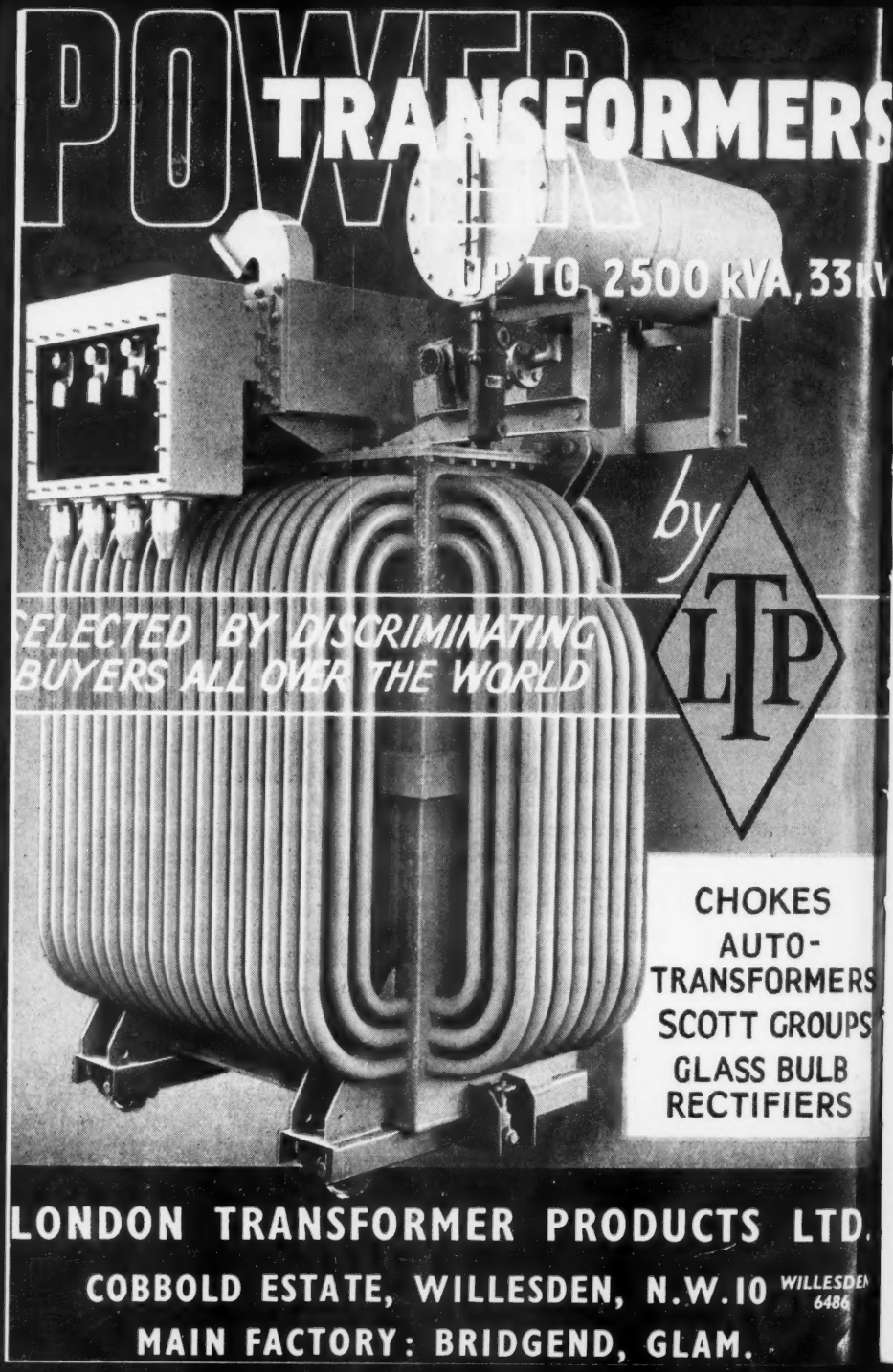


# NOT ALL MVA's

Not all the transformers we build are measured in MVA, but our reputation for building transformers with "plenty to spare" certainly seems to be attracting a lot of large jobs our way. The three 15 MVA units on the left are for the B.E.A.; the two 4 MVA units in the centre are for the N.C.B.; while the 10 MVA unit just showing on the right is for Australia. When you're needing a big unit - or a little one - it's worth remembering that a J.& P transformer has "plenty to spare."

**JOHNSON & PHILLIPS LTD.,**
**CHARLTON · LONDON · SE7**

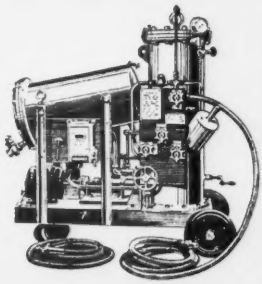



POWER TRANSFORMERS
UP TO 2500 kVA, 33kV
by
LTP
SELECTED BY DISCRIMINATING BUYERS ALL OVER THE WORLD
CHOKES
AUTO-TRANSFORMERS
SCOTT GROUPS
GLASS BULB RECTIFIERS
LONDON TRANSFORMER PRODUCTS LTD.
COBBOLD ESTATE, WILLESDEN, N.W.10
WILLESDEN 6486
MAIN FACTORY: BRIDGEND, GLAM.

RS
33KV
ES
-
RMERS
ROUPS
ULB
ERS
LTD.
VILLESDEN
6486

# Cold Filtration of Insulating Oils

The insulating value of used transformer and switch oils by one passage through the Metafilter is raised to a higher break-down voltage than the new oil.
The plant is purely mechanical and extremely simple in operation.



*Capacities from 20 gallons to 1,000 gallons per hour.*

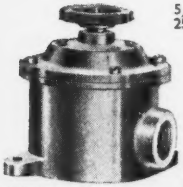
## METAFILTRATION

PHONE: HOUNSLOW 1121/2/3
GRAMS: METAFILTER, HOUNSLOW

THE METAFILTRATION COMPANY LIMITED, BELGRAVE ROAD, HOUNSLOW, MIDDLESEX

REGD TRADE MARK
NIPHAN

**WEATHERPROOF METAL-CLAD PLUGS, SOCKETS SWITCH PLUGS, ETC.**
**for all electrical purposes**



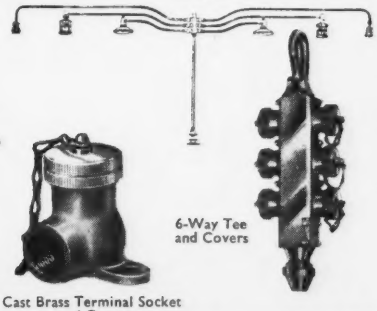
C.I. Switch

5/300 amp.
250/500 volt

Push-on Plug

Push-on Flange Socket with Spring Cover

Diagram for Temporary Lighting with Fittings connected to 6-Way Tee



6-Way Tee and Covers



Cast Brass Terminal Socket and Cover

*Latest Catalogue on application*

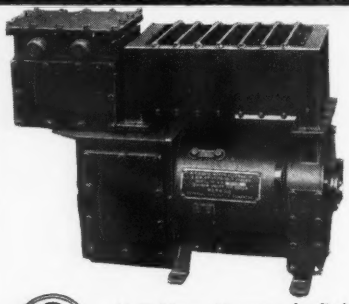
## SIMMONDS & STOKES LIMITED

MANUFACTURING ELECTRICAL ENGINEERS

Victoria House, Southampton Row, London, W.C.1 · Holborn 8637 and 2163

**OVERSEAS AGENTS:** S. AFRICA, *Hubert Davies & Co., Ltd., Johannesburg.* NEW ZEALAND, *Samuel Brown, Ltd., Wellington.* INDIA, *G.E.C (India) Ltd., Calcutta.* CEYLON, *Walker & Greig, Ltd., Colombo.*

# NEWTON-DERBY
## ELECTRICAL EQUIPMENT



H F Motor Alternator for Radar. Output 2 KW. 80 volts AC. 1,500 cycles per second. Watertight. Fitted with Automatic Voltage Regulator.

## HIGH FREQUENCY ALTERNATORS

*(Send for Publication No. 1003)*

Also makers of Rotary Transformers and Anode Converters, Wind and Engine Driven Aircraft Generators, High Tension D.C. Generators, and Automatic Carbon Pile Voltage Regulators.

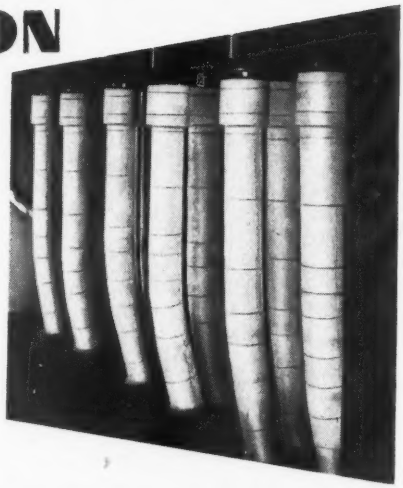
**NEWTON BROTHERS (DERBY) LTD.**

HEAD OFFICE & WORKS: ALFRETON ROAD, DERBY.
TELEPHONE: DERBY 4286/7 TELEGRAMS: DYNAMO, DERBY.
LONDON OFFICE: IMPERIAL BUILDINGS, 56 KINGSWAY W.C.2.

# PROTECTION *Against* FIRE

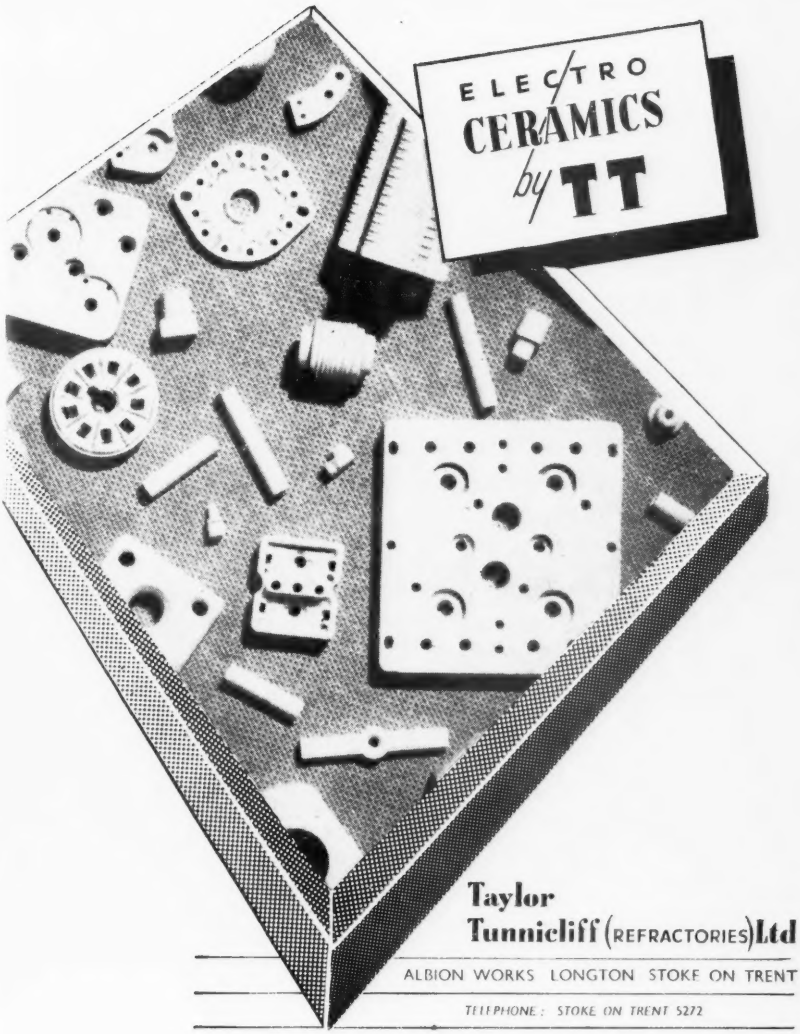
## NEWALLS MOULDED ASBESTOS

is made in sheets and sections for the protection of electric cables and structural steelwork from fire. It can also be supplied in almost any shape to form covers for cable and cable-ducting. The fire-endurance period of 1" Moulded Asbestos is 1 hour. Tests made under B.S.I. conditions have proved this. Illustrated reports on these tests are available from



**NEWALLS INSULATION CO. LTD.** HEAD OFFICE **WASHINGTON, COUNTY DURHAM**
A MEMBER OF THE TURNER AND NEWALL ORGANISATION.

Offices and Depots at LONDON, GLASGOW, MANCHESTER, NEWCASTLE, BIRMINGHAM, BELFAST, BRISTOL and CARDIFF

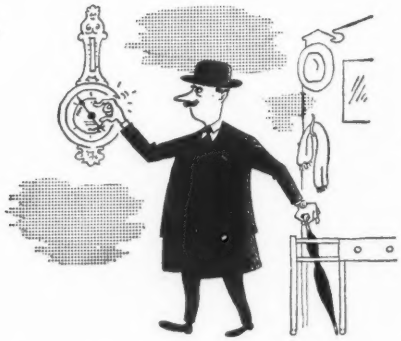



Taylor
Tunnicliff (REFRACTORIES) Ltd

ALBION WORKS LONGTON STOKE ON TRENT

TELEPHONE: STOKE ON TRENT 5272

LONDON OFFICE: 125 HIGH HOLBORN, LONDON, W.C.1 TELEPHONE: HOLBORN 1951



# Further outlook..?

The uncertainty of the Raw Materials Situation finds us undergoing heavy weather from time to time, consequently we can't always keep our friends in the Trade so well stocked with Swan Brand as we—and they—could wish. In spite of everything, however, we do our best—Swan Brand Quality is still the same high standard, prices and delivery are scrupulously fair, and if delivery isn't all that it might be, please be patient . . . things won't *always* be so unsettled!

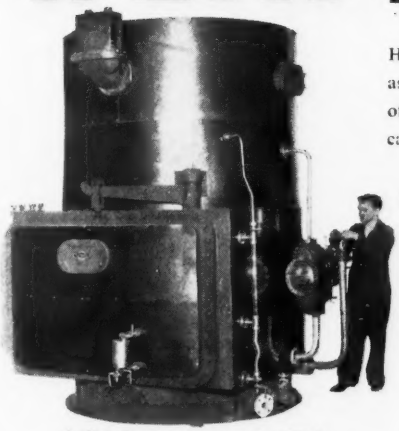
SWAN BRAND

**Electrical Appliances & Aluminium Holloware**

BULPITT & SONS LTD., ST. GEORGE'S WORKS, ICKNIELD ST., BIRMINGHAM 18

M-W.225

# WEIR EVAPORATORS



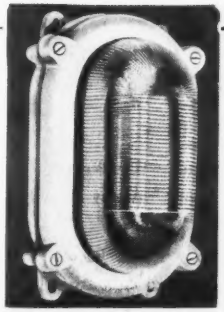
A Weir Evaporator to supply 4,750 lb. vapour per hour for a Power Station.

High-pressure boilers demand pure feed make-up as an absolute necessity. Apart from the prevention of tube failures, high boiler and turbine efficiencies can be maintained, fuel consumption minimized, blow-down heat loss obviated, and stoppages for cleaning rendered unnecessary. Weir Evaporators are made in single or multi-stage, horizontal or vertical designs for high or low pressures.

*Write for Publication GI.151*

G. & J. WEIR LTD.
CATHCART : GLASGOW

# PRISMATIC BULKHEAD
(APPROVED L.C.C. PATTERN)



Cast Iron Body and Lid

Non-corrosive Reflector

Porcelain B.C. Lampholder

*Can be supplied with WIRE GUARD*

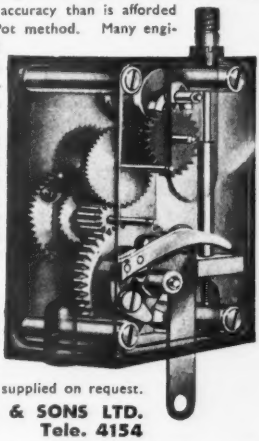
***DESIGNED TO GIVE MAXIMUM VERTICAL & HORIZONTAL DISTRIBUTION OF LIGHT***

*Write for full particulars to*

**C. M. CHURCHOUSE LTD.**
Clarendon Works, Clarendon Cross, London, W.11
*Phone : Park 8617*

# TIME LAGS

The important part in so many processes played by delayed action timing mechanisms has led to a demand for much greater accuracy than is afforded by the Oil Dash Pot method. Many engineers have found such problems completely answered by Rotherham Time Lags. For accuracy and reliability these ingenious instruments are worthy products of the famous House of Rotherham & Sons of Coventry.



Details of the various types available, and also of Instruments, Recording Clocks, etc., will gladly be supplied on request.

**ROTHERHAM & SONS LTD.**
**COVENTRY. Tele. 4154**

*PRECISION MANUFACTURERS SINCE 1750*

APRIL 30 –MAY 11

*An International market place*

In size and significance the British Industries Fair this year will surpass all its twenty-nine predecessors.

To buyers from every part of the world this vast display will demonstrate Britain's increasing capacity and industrial enterprise.

***BIF means business!***

**LONDON—EARLS COURT AND OLYMPIA.** Weekdays 9.30 a.m.—6 p.m. Buyers Badges and Catalogues 2/6 each, obtainable at Fair. Public admitted Saturday and Wednesday (May 5 and 9) 1/6 each building.

**BIRMINGHAM—CASTLE BROMWICH.** Weekdays 9.30 a.m.—6 p.m. Buyers Badges and Catalogues 2/6 each, obtainable at Fair. Public admitted daily from 2 p.m. (all day Saturday) 2/6.

ELECTRICAL EQUIPMENT
AT CASTLE BROMWICH

**Hot brass & copper pressings**
**of every description for the electrical industry**
We can supply pressings only or pressings machined to customers' requirements
**SUTCLIFFE SPEAKMAN**
AND COMPANY LIMITED, LEIGH, LANCASHIRE
London Office: Godliman House, Godliman St., E.C.4. Phone: City 2810

# CARPENTER POLARIZED RELAY TYPE 5

***HIGH PERFORMANCE — SMALL SIZE***

*Outstanding characteristics*

- **High operational speed**
- **Freedom from contact rebound and positional error**
- **Good contact pressures**
- **Sensitivity of the order 0.12 mW D.C.**
- **Accuracy of signal repetition**
- **Rugged design**
- **Exceptional thermal stability**

*Height base to top* $2\frac{7}{16}$ *ins.* (56 *mm.*)
*Width* $1\frac{7}{16}$ *ins.* (37 *mm.*) *Depth* $\frac{3}{4}$ *in.* (19 *mm.*)
*Weight* 4.8 *ozs.* (137 *gm.*)

*Complete details available on request.* *Manufactured by the Sole Licensees.*

**TELEPHONE MANUFACTURING COMPANY LIMITED**
*Contractors to British, Commonwealth and Foreign Governments*
**HOLLINGSWORTH WORKS · DULWICH · LONDON S.E.21**
*Telephone:* **GIPsy Hill 2211 (10 lines)**

# *Phone* ARMORDUCT

**LONDON** *Waterloo 6056-7*
**LEEDS** *28129*
**BIRMINGHAM** *Colmore 4594*
**MANCHESTER** *Blackfriars 5405*

**BRISTOL** *24096*
**NOTTINGHAM** *41672*
**DUBLIN** *73427*
**WORKS** *Long Eaton 441*

***ARMORDUCT CABLE CO. LTD.*** *256 Westminster Bridge Rd., London, S.E.1*

## MICA AND MICANITE INSULATORS

**Precision Gauged and Stamped Condenser Plates**
**Radio Valve Spacers, etc.**

TAYLOR & PETTERS LTD., 3-11 WESTLAND PLACE,
Insulating Engineers Tel.: Clerk. 4105 N.1

MEKELITE INDUSTRIAL LIGHTING UNITS

MEK-ELEK Engineering Ltd.
17, Western Road, Mitcham, Surrey

## ECHO TESTER

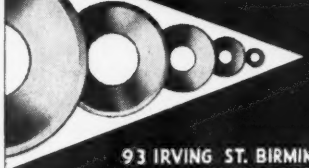
New electronic type instantly detects faults in Armatures, Stators, Field and other Coil Windings. A.C. or D.C.

*Send for interesting leaflet—25D*

STAND C 730 B.I.F.

RUNBAKEN · MANCHESTER 1

## WASHERS LTD.



93 IRVING ST. BIRMINGHAM 15
MIDLAND 1423


Published by ELECTRICAL REVIEW PUBLICATIONS LTD., at Dorset House, Stamford Street, London, S.E.1 and printed in Great Britain at THE CHAPEL RIVER PRESS, Andover, Hants.

# *Light Alloy Diecastings*

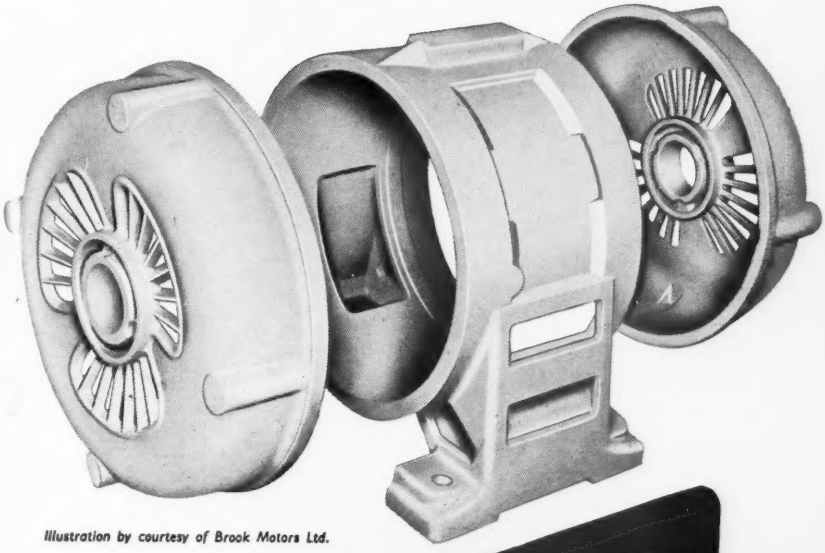


*Illustration by courtesy of Brook Motors Ltd.*

ELECTRIC MOTOR ENDSHIELDS & YOKE DIE CAST IN ALUMINIUM ALLOY (Range covers 1 to 3 h.p.)

USE LIGHT ALLOYS TO INCREASE PRODUCTION EFFICIENCY & REDUCE HANDLING & MACHINING COSTS

# STERLING METALS LTD.

COVENTRY

TELEPHONE: COVENTRY 89031 (6 LINES) TELEGRAMS: STERMET PHONE COVENTRY

OUR FACILITIES ARE READILY AVAILABLE FOR CONSULTATION ON NEW PRODUCTS

## YOU'RE NEVER FAR

*55, Washington St., Glasgow.*

## FROM BIG STOCKS OF

*54a, Newton St., Manchester.*

## GENERAL CABLES

*204, Newhall St., Birmingham.*

*Leatherhead, Surrey.*

Comprehensive stocks of General Cables are held at Leatherhead, Birmingham, Manchester and Glasgow. Deliveries can be made at short notice through your usual wholesaler.

*In case of difficulty write to*

**THE GENERAL CABLE MANUFACTURING CO. LTD.**
**LEATHERHEAD, SURREY.**

TELEPHONE: Leatherhead 3021 (4 lines)
TELEGRAMS: Isolde, Leatherhead.

**"GOOD CABLES TODAY PREVENT TROUBLE TOMORROW"**